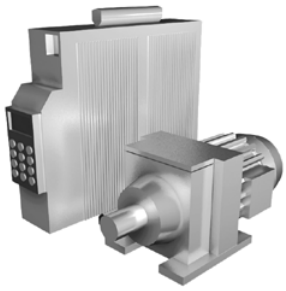
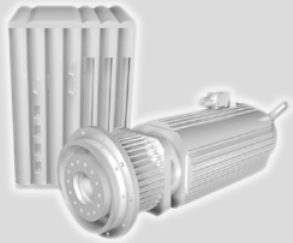
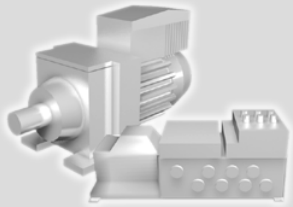
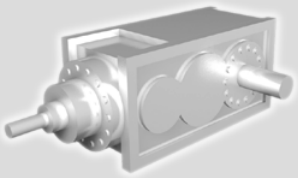
SEW EURODRIVE









AC Motors DRS/DRE/DRP

Edition 07/2007
11651814 / EN

Operating Instructions

SEW EURODRIVE

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1 General Information

1.1 Structure of the safety notes

The safety notes in these operating instructions are designed as follows:

Pictogram	⚠ SIGNAL WORD!
	Type and source of danger. Possible consequence(s) if the safety notes are disregarded. • Measure(s) to prevent the danger.

Pictogram	Signal word	Meaning	Consequences in case of disregard
Example: General danger Specific danger, e.g. electric shock	⚠ **DANGER!**	Imminent danger	Severe or fatal injuries
	⚠ **WARNING!**	Possible dangerous situation	Severe or fatal injuries
	⚠ **CAUTION!**	Possible dangerous situation	Minor injuries
	STOP!	Possible damage to property	Damage to the drive system or its environment
	NOTE	Useful information or a tip Simplifies the handling of the drive system	

1.2 Rights to claim under limited warranty

A requirement of fault-free operation and fulfillment of any rights to claim under limited warranty is that you adhere to the information in the operating instructions. Consequently, read the operating instructions before you start working with the unit!

Make sure that the operating instructions are available to persons responsible for the plant and its operation, as well as to person who work independently on the unit. You must also ensure that the documentation is legible.

1.3 Exclusion of liability

You must comply with the information contained in these operating instructions to ensure safe operation of the electric motors and to achieve the specified product characteristics and performance requirements. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, any liability for defects is excluded.

2 Safety Notes

The following basic safety notes must be read carefully to prevent injury to persons and damage to property. The operator must make sure that the basic safety notes are read and observed. Make sure that persons responsible for the plant and its operation, as well as persons who work independently on the unit, have read through the operating instructions carefully and understood them. If you are unclear about any of the information in this documentation, please contact SEW-EURODRIVE.

2.1 Preliminary information

The following safety notes are concerned with the use of motors. If using gearmotors, please also refer to the safety notes for gear units in the corresponding operating instructions.

Also consider the supplementary safety notes in the individual sections of these operating instructions.

2.2 General information

Never install damaged products or take them into operation. Submit a complaint to the shipping company immediately in the event of damage.

Low-voltage machines have dangerous, live and rotating parts as well as hot surfaces.

All work related to transportation, putting into storage, setup/mounting, connection, startup, maintenance and repair may only be carried out by qualified personnel observing

- The relevant detailed operating instruction(s) and wiring diagrams
- The warning and safety signs on the motor/gearmotor
- The specific regulations and requirements for the system
- The national/regional regulations governing safety and the prevention of accidents

Removing covers without authorization, improper use as well as incorrect installation or operation may result in severe injuries to persons or damage to machinery.

Consult the documentation for additional information.

2.3 Designated use

The electric motors are intended for industrial systems. The use in potentially explosive atmospheres is not permitted unless the unit has been designed expressly for this purpose.

Air-cooled variants are designed for ambient temperatures of -20 °C to +40 °C and altitudes of ≤ 1,000 m above sea level. Please take into account deviating specifications on the nameplate. The conditions where the unit is used must comply with all specifications on the nameplate.

2.4 Transport

Inspect the shipment for any damage that may have occurred in transit as soon as you receive the delivery. Inform the shipping company immediately. You may need to preclude startup.

Tighten the eyebolts. They are only rated for the weight of the motor/gearmotor; do not attach any additional loads.

The installed lifting eyebolts are in accordance with DIN 580. The loads and regulations specified in that document must always be observed. If the gearmotor is equipped with two suspension eye lugs or lifting eyebolts, then both of the suspension eye lugs should be used for transportation. In this case, the tension force vector of the slings must not exceed a 45° angle according to DIN 580.

Use suitable, sufficiently rated handling equipment if necessary. Remove any transportation restraints prior to startup. Re-use for any further transports. When storing low voltage machines, make sure to keep it in a dry, dust-free environment with minimum vibration ($v_{eff} \leq 0.2$ mm/s) (damage to stalled bearings). Measure the insulation resistance before startup. Dry the winding if values ≤ 1 k per volt of the rated voltage.

2.5 Installation

Make sure the feet and flanges are safely fixed and rest positively on their entire surface. Check the exact alignment with direct coupling. Avoid resonance of the base with the rotational frequency and double mains frequency. Turn the rotor by hand and listen for unusual grinding noises. Check the direction of rotation with the machine uncoupled.

Use only suitable tools to mount or pull off belt pulleys or couplings (heat) and cover with a protection against accidental contact. Avoid unadmissible tension of the belts.

Provide necessary pipe connections, if required. For vertical shaft-up designs, suitable protection must be provided at the mounting end so that no foreign matter can enter the ventilation holes. Such protection must, however, not affect the cooling and air leaving the motor – or adjacent groups – must not be drawn in again.

Observe the notes in sec. "Mechanical Installation".

2.6 Electrical connection

All work may only be carried out by qualified personnel. During work, the low-voltage machine must be at standstill in enabled condition and safeguarded against unintentional restart. This also applies to auxiliary power circuits (e.g. anti-condensation heating).

Ensure that the unit is de-energized!

Exceeding the tolerances in EN 60034-1 (VDE 0530, part1) – voltage + 5 %, frequency + 2 %, curve shape, symmetry - increases the temperature and influences electromagnetic compatibility. Observe nameplate data and the wiring diagram in the terminal box.

Note the wiring information and deviating data on the nameplate and the wiring diagram.

The supply cables must be connected with special care to ensure permanent and reliable contact (without loose cable ends); use assigned terminals for the connection cables. Ensure a safe connection of the protective earth conductor. When the motor is connected, the distances to live and uninsulated parts may not be below the minimum values specified in IEC 60664 and in national regulations. The minimum distances for low voltage according to IEC 60664 are:

Rated voltage V_R	Distance
≤ 500 V	3 mm
≤ 690 V	5.5 mm

Make sure that no foreign matter is left in the terminal box, and that it is clean and dry. Cable entries which are not used and the terminal box itself have to be sealed dust- and watertight. Secure keys for test mode without output elements. Check whether the brake is functioning correctly before startup when using a low voltage machine with brake.

Observe the notes in sec. "Electrical Installation"!

2.7 Operation

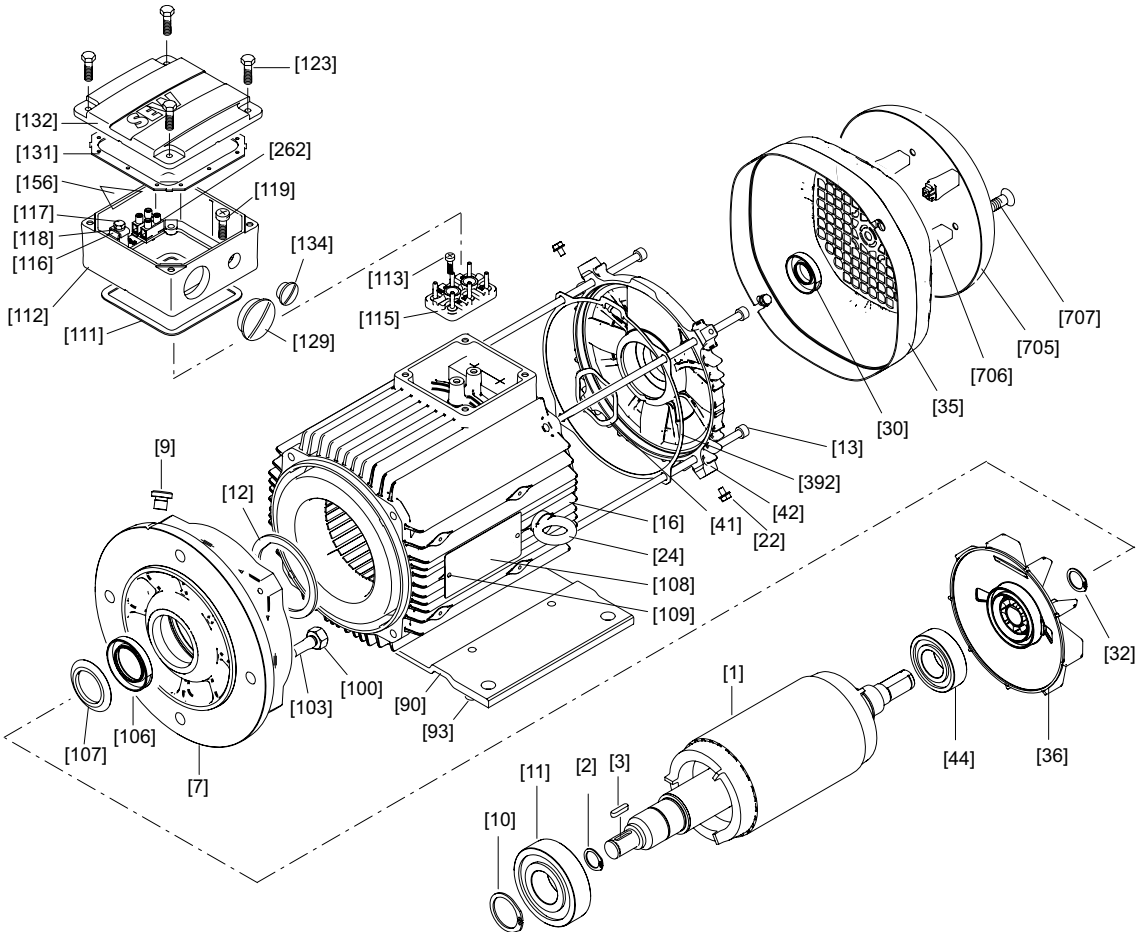
Whenever changes occur in relation to normal operation, such as increased temperatures, noise, oscillation, determine the cause and contact the manufacturer, if required. Never bypass or disable protection devices, not even in test mode. If you are in doubt, switch off the motor.

Regularly clean air ducts in dusty or dirty environments.

3 Motor Design

	NOTE
	The following illustration is intended to explain the general structure. Its only purpose is to facilitate the assignment of components to the spare parts lists. Discrepancies are possible depending on the motor size and version!

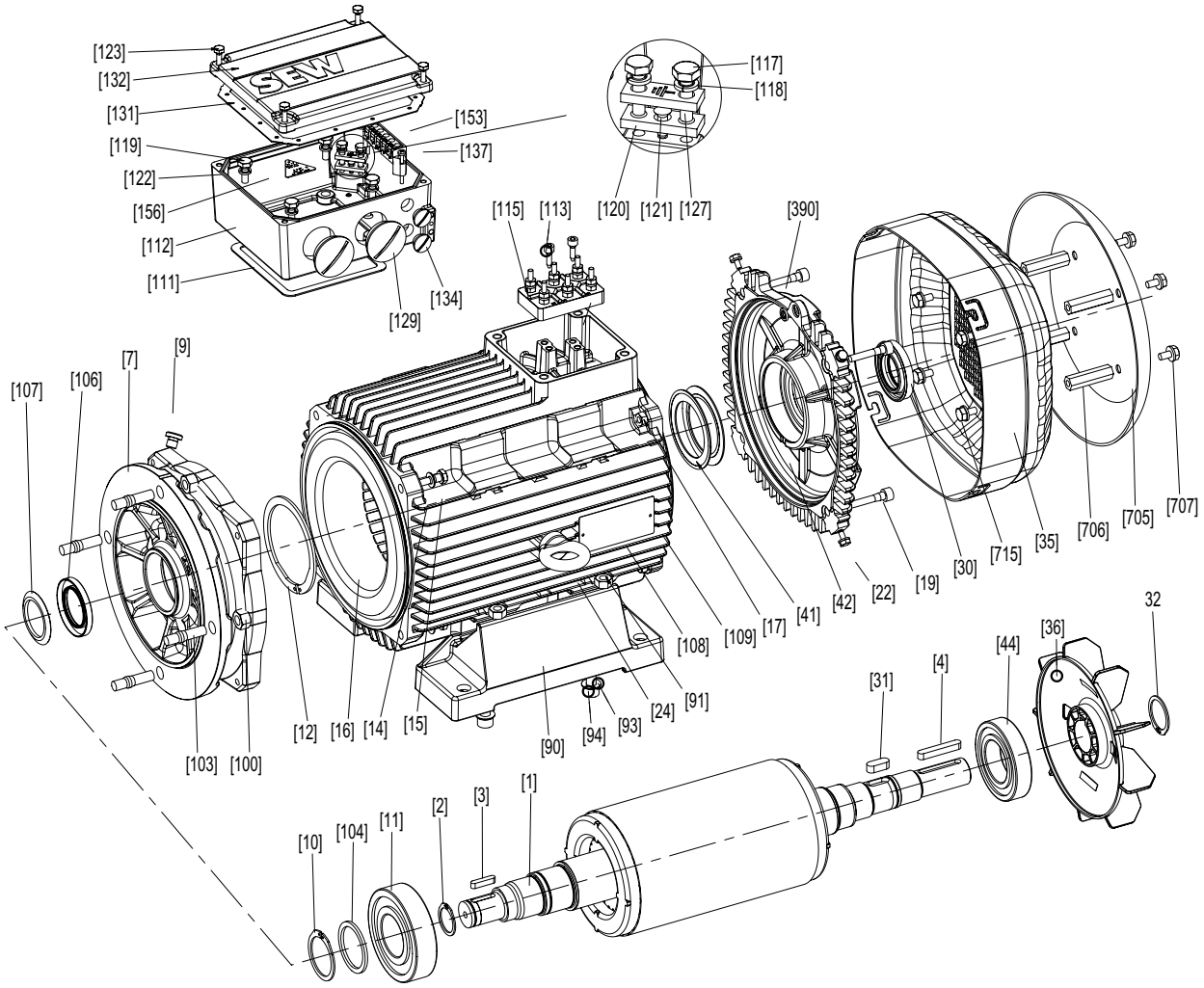
3.1 Basic design of DR.71 – DR.132



173332747

[1] Rotor
[2] Circlip
[3] Key
[7] Flanged end shield
[9] Screw plug
[10] Circlip
[11] Deep groove ball bearing
[12] Circlip
[13] Machine screw
[16] Stator
[22] Hex head bolt
[24] Lifting eyebolt
[30] Oil seal
[32] Circlip
[35] Fan guard
[36] Fan
[41] Equalizing ring
[42] B-side endshield
[44] Deep groove ball bearing
[90] Base plate
[93] Pan head screw
[100] Hexagonal nut
[103] Stud
[106] Oil seal
[107] Oil-flinger ring
[108] Nameplate
[109] Grooved pin
[111] Seal for bottom part
[112] Terminal box lower part
[113] Pan head screw
[115] Terminal board
[116] Terminal clip
[117] Hex head bolt
[118] Lock washer
[119] Pan head screw
[123] Hex head bolt
[129] Screw plug with O-ring
[131] Gasket for cover
[132] Terminal box cover
[134] Screw plug with O-ring
[156] Information sign
[262] Terminal clip, complete
[392] Gasket
[705] Protection canopy
[706] Spacer
[707] Pan head screw

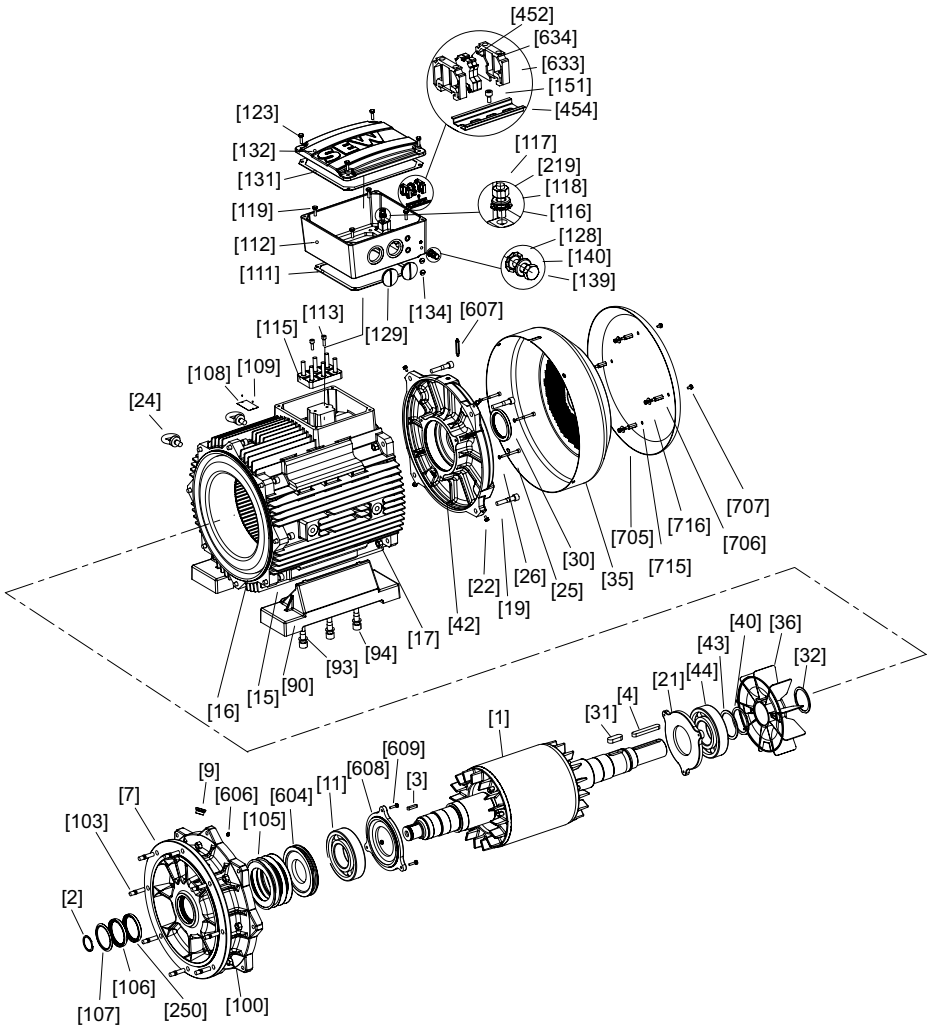
3.2 Basic design of the DR.160



527322635

[1] Rotor
[2] Circlip
[3] Key
[4] Key
[7] Flange
[9] Screw plug
[10] Circlip
[11] Deep groove ball bearing
[12] Circlip
[14] Disc
[15] Hex head bolt
[16] Stator
[17] Hexagonal nut
[19] Machine screw
[22] Hex head bolt
[24] Lifting eyebolt
[30] Sealing ring
[31] Key
[32] Circlip
[35] Fan guard
[36] Fan
[41] Spring washer
[42] Non drive-end bearing shield
[44] Deep groove ball bearing
[90] Foot
[91] Hexagonal nut
[93] Disc
[94] Machine screw
[100] Hexagonal nut
[103] Stud
[106] Oil seal
[107] Oil-flinger ring
[108] Nameplate
[109] Grooved pin
[111] Seal for bottom part
[112] Terminal box lower part
[113] Bolt
[115] Terminal board
[117] Hex head bolt
[118] Lock washer
[119] Hex head bolt
[120] Grounding terminal bottom
[121] Grooved pin
[122] Lock washer
[123] Hex head bolt
[127] Grounding terminal top
[129] Screw plug with O-ring
[131] Gasket for cover
[132] Terminal box cover
[134] Screw plug with O-ring
[137] Bolt
[153] Terminal strip, complete
[156] Information sign
[390] O-ring
[705] Protection canopy
[706] Spacer
[707] Hex head bolt
[715] Hex head screw

3.3 Basic design of the DR.315



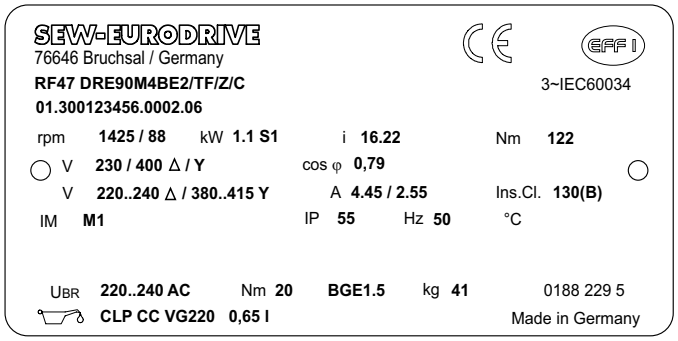
351998603

[1] Rotor
[2] Circlip
[3] Key
[4] Key
[7] Flange
[9] Screw plug
[11] Rolling element bearings
[15] Machine screw
[16] Stator
[17] Hexagonal nut
[19] Machine screw
[21] Oil seal flange
[22] Hex head bolt
[24] ifting eyebolt
[25] Machine screw
[26] Sealing washer
[30] Oil seal
[31] Key
[32] Circlip
[35] Fan guard
[36] Fan
[40] Circlip
[42] Non drive-end bearing shield
[43] Supporting ring
[44] Rolling element bearings
[90] Foot
[93] Disc
[94] Machine screw
[100] Hex nut
[103] Stud
[105] Spring washer
[106] Oil seal
[107] Oil flinger
[108] Nameplate
[109] Grooved pin
[111] Gasket for lower part
[112] Terminal box lower part
[113] Machine screw
[115] Terminal board
[116] Serrated lock washer
[117] Stud
[118] Washer
[119] Hex head screw
[123] Hex head screw
[128] Serrated lock washer
[129] Screw plug
[131] Gasket for cover
[132] Terminal box cover
[134] Screw plug
[139] Hex head screw
[140] Washer
[151] Machine screw
[219] Hex nut
[250] Oil seal
[452] Terminal strip
[454] DIN rail
[604] Oiling ring
[606] Grease nipple
[607] Grease nipple
[608] Oil seal flange
[609] Hex head screw
[633] End holder
[634] End plate
[705] Protection canopy
[706] Spacer bolt
[707] Hex head screw
[715] Hex nut
[716] Washer

3.4 Nameplate, unit designation

3.4.1 Nameplate

Example: DRE gearmotor with brake



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3.4.2 Unit designation

Example: AC motor with feet and brake

DRE 90 M4 BE2 /FI /TF /ES7S

- Motor option sine encoder ES7S
- Motor option thermal motor protection with thermistor TF
- IEC motor type
- Motor with brake BE2
- Motor length and number of poles
- Motor size
- DR motor series with code letter E type CEMEP EFF1 energy efficient motor or MEPS A2

4 Mechanical Installation

	NOTE
	It is essential to observe the safety notes in section 2 during installation.

4.1 Before you start

The drive may only be installed when

- The entries on the nameplate of the drive and/or the output voltage of the frequency inverter match the voltage supply system
- The drive is undamaged (no damage caused by transportation or storage).
- It is certain that the following requirements have been met:
  - Ambient temperature between -20 °C and 40 °C [1)]
  - No oil, acid, gas, vapors, radiation, etc.
  - Installation altitude max. 1000 m above sea level.
  - Note the restrictions for encoders
  - Special versions: Drive configured in accordance with the ambient conditions.

	STOP
	Make sure the mounting position corresponds to the information on the nameplate!

4.2 Mechanical installation

4.2.1 Preliminary work

Motor shaft ends must be thoroughly cleaned of anti-corrosion agents, contamination or similar (use a commercially available solvent). Do not allow the solvent to penetrate the bearings or shaft seals – this could damage the material.

Motors with reinforced bearing

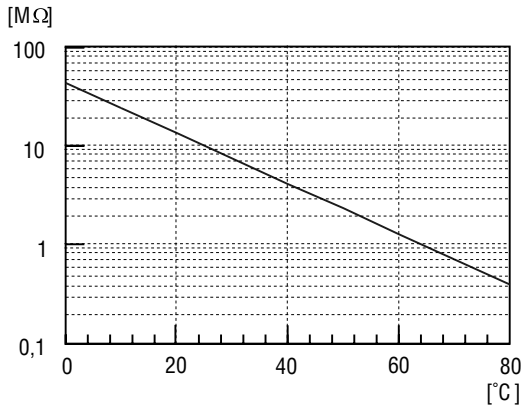
	STOP
	Motors with reinforced bearing may not be operated without any overhung loads. The bearings might be damaged.

1) Note that the temperature range of the gear unit may also be restricted (see gear unit operating instructions).

Long-term storage of motors

- Please note that the grease utilization period of the ball bearings is reduced by 10 % each year after storage periods exceeding one year.
- Re-lubricate motors with relubrication device that have been stored longer than 5 years before startup. Observe the information on the lubrication plate of the motor.
- Check whether the motor has absorbed moisture as a result of being stored for a long time. Measure the insulation resistance for this purpose (measuring voltage 500 V).

The insulation resistance (see following figure) varies greatly depending on the temperature. The motor must be dried if the insulation resistance is not adequate.



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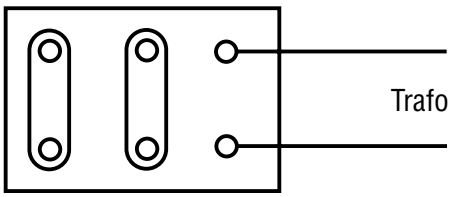
Drying the motor

Heat the motor:

- With hot air or
- Via isolation transformer
  - Connect the windings in series (see following figure)
  - Auxiliary AC voltage supply max. 10 % of the rated voltage with max. 20 % of the rated current



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The drying process is finished when the minimum insulation resistance has been exceeded.

Check terminal box whether:

- The inside is clean and dry
- The connections and fixing parts are free from corrosion
- Seals and sealing surfaces are ok
- The cable glands are sound, otherwise clean or replace them.

4.2.2 Installing the motor

The motor or gearmotor may only be mounted or installed in the specified mounting position on a level and torsionally rigid support structure that is not subject to shocks.

Carefully align the motor and the driven machine to avoid placing any unacceptable strain on the output shafts (observe permitted overhung load and axial load!).

Do not butt or hammer the shaft end.

Use an appropriate cover to protect motors in vertical mounting positions from objects or fluids entering (protection cowl C).

Ensure an unobstructed cooling air supply and that air heated by other apparatus cannot be drawn in or reused.

Balance components for subsequent mounting on the shaft with a half key (motor shafts are balanced with a half key).

Existing condensation drain holes are sealed with closing plugs. Drain holes can be opened if required to drain the condensation but have to be closed again because open drain holes make higher protection ratings ineffective.

If using brake motors with manual brake release, screw in either the hand lever (with self-reengaging manual brake release) or the setscrew (with lockable manual brake release).

Installation in damp locations or in the open

If possible, arrange the terminal box so that the cable entries are pointing downwards.

Coat the threads of cable glands and filler plugs with sealing compound and tighten them well – then coat them again.

Seal the cable entry well.

Clean the sealing surfaces of the terminal box and the terminal box cover carefully before re-assembly; gaskets have to be glued in on one side. Replace brittle gaskets.

Restore the anticorrosive coating if necessary.

Check the degree of protection.

4.2.3 Installation tolerances

Shaft end	Flanges
Diameter tolerance according to EN 50347 • ISO j6 with ∅ ≤ 28 mm • ISO k6 with ∅ ≥ 38 mm up to ≤ 48 mm • ISO m6 for ∅ ≥ 55mm • Center bore in accordance with DIN 332, shape DR..	Centering shoulder tolerance according to EN 50347 • ISO j6 with ∅ ≤ 250 mm • ISO h6 for ∅ ≥ 300 mm

5 Electrical Installation

	NOTES
	• It is essential to observe the safety notes in section 2 during installation. • Switch contacts in utilization category AC-3 to EN 60947-4-1 must be used for switching the motor and the brake.

5.1 Using the wiring diagrams

Connect the motor only as shown in the wiring diagram(s) included with the motor. **Do not connect or start up the motor if the wiring diagram is missing.** You can obtain the valid wiring diagrams free of charge from SEW-EURODRIVE.

5.2 Wiring notes

Comply with the safety notes during startup.

5.2.1 Protection against interference from brake control systems

Brake cables must always be routed separately from other power cables with phased currents unless they are shielded to protect brake control systems against interference. Power cables with phased currents are in particular

- Output cables from frequency inverters and servo controllers, soft start units and brake units
- Supply cables for brake resistors and similar options

5.2.2 Protecting motor protection devices against interference

To protect SEW motor protection devices (TF temperature sensors, TH winding thermostats) against interference:

- Route separately shielded supply cables together with switched-mode power lines in one cable.
- Do not route unshielded supply cables together with switched-mode power lines in one cable.

5.3 Special aspects for operation with a frequency inverter

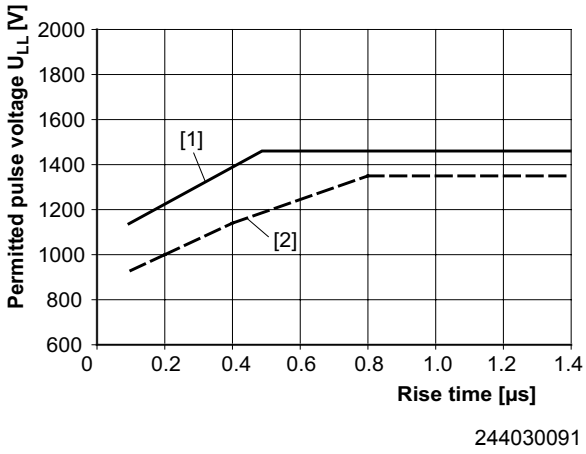
When motors are powered from inverters, you must adhere to the wiring instructions issued by the inverter manufacturer. It is essential to observe the operating instructions for the frequency inverter.

5.3.1 Motor on SEW inverter

SEW-EURODRIVE has tested operation of the motor on SEW frequency inverters. The required dialectic strength values of the motors were confirmed and the startup routines adjusted to the motor data. You can operate the DR motor with any frequency inverter from SEW-EURODRIVE. To do so, startup the motor according to the operating instructions of the frequency inverter.

5.3.2 Motor on non-SEW frequency inverter

Operation of SEW motors on non-SEW frequency inverters is permitted if the pulse voltages indicated in the following figure are not exceeded for the specified rise times.



[1] Permitted pulse voltage for DR standard
[2] Permitted pulse voltage according to IEC 60 034-17

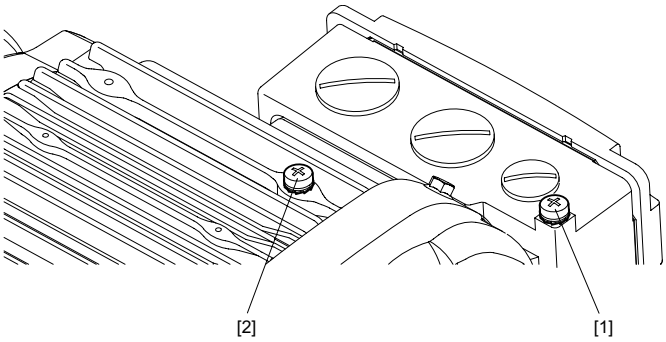
	NOTE
	The diagram applies to motor operation. If the permitted pulse voltage is exceeded, limiting measures such as filters, chokes or special motor cables have to be used. Ask the manufacturer of the frequency inverter in this case.

5.4 Improving the grounding (EMC)

For improved, low-impedance grounding at high frequencies, we recommend using the following connections:

5.4.1 Size DR.71-DR.132:

Size DR.71-DR132
• 1 x self-tapping screw DIN 7500 M5 x 12 • 1 x disk ISO 7090 • 1 x serrated lock washer DIN 6798



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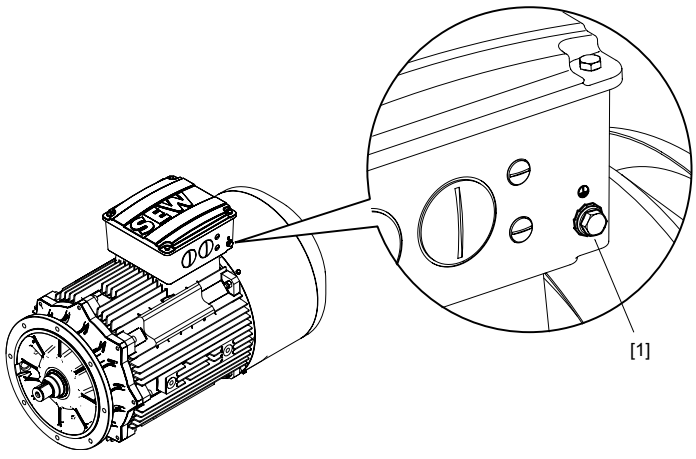
[1] Use the pre-cast bore at the terminal box (brake motor)
[2] Bore in stator housing with ∅ =4.6 and t_{max}= 11.5

5.4.2 Size DR.160-DR.315:

Size DR.160	Size DR.315
• 1 x hex head screw ISO 4017 M8 x 20 • 1 x disk ISO 7090 • 1 x serrated lock washer DIN 6798	• 1 x hex head screw ISO 4017 M12 x 30 • 1 x disk ISO 7090 • 1 x serrated lock washer DIN 6798



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[1] Using the grounding screw on the terminal box

5.5 Special aspects in switching operation

When the motors are used in switching operation, possible interference of the switchgear must be excluded by ensuring suitable wiring. According to EN 60204 (electrical equipment of machines), motor windings must have interference suppression to protect the numerical or programmable logic controllers. As it is primarily switching operations that cause interference, SEW-EURODRIVE recommends installing protective circuitry in the switching devices.

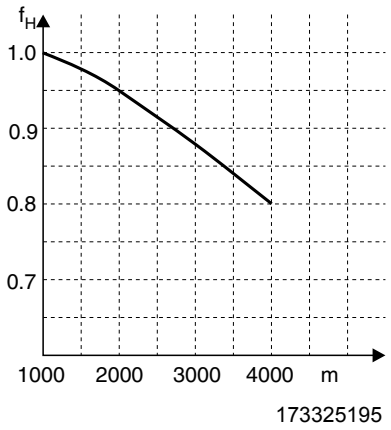
5.6 Ambient conditions during operation

5.6.1 Ambient temperature

The temperature range of -20 °C to 40 °C must be ensured unless specified otherwise on the nameplate. Motors intended for use in higher or lower ambient temperatures have the appropriate designation on the nameplate.

5.6.2 Installation altitude

The maximum installation altitude of 1,000 m above sea level must not be exceeded. Otherwise, power is reduced by the factor f_H according to the diagram below.



The reduced rated power is calculated according to the following formula:

$$P_{N1} = P_N \times f_H$$

P_{N1} = Reduced rated power [kW]
P_N = Rated power [kW]
f_H = Factor for reduction due to installation altitude

5.6.3 Hazardous radiation

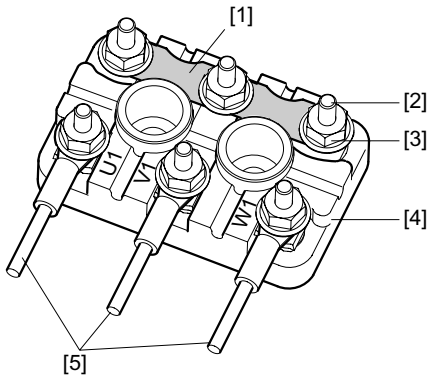
Motors must not be subjected to hazardous radiation (such as ionizing radiation). Contact SEW-EURODRIVE if necessary.

5.7 Connecting the motor

5.7.1 Connecting the motor via terminal box

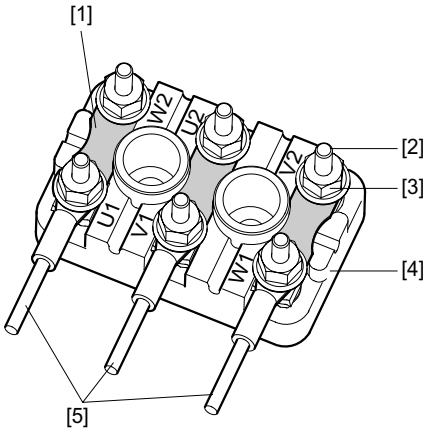
- According to the circuit diagram provided
- Check cable cross section
- Arrange terminal links correctly
- Tighten connections and protective earth
- In the terminal box: Check winding connections and tighten them if necessary

Layout of the terminal links for ⅄ connection

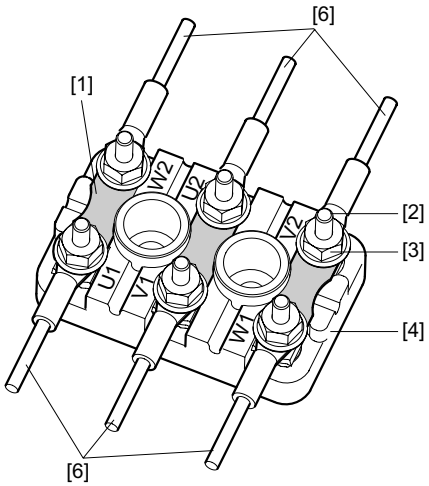


Layout of the terminal links for △ connection

Motor size DR.71-DR.160:



Motor size DR.315:



[1] Terminal link
[2] Terminal stud
[3] Hexagon nut with flange
[4] Terminal board
[5] Customer connection
[6] Customer connection with split connection cable

NOTE

The terminal box must be free of foreign objects, dirt and humidity. Unused cable entry openings and the terminal box itself must be closed so they are dust and water proof.

5.7.2 Motor connection terminal board

Depending on the electric design, the motors are supplied and connected in different ways. The terminal links must be arranged according to the wiring diagram and screwed in tightly. Observe the tightening torques specified in the following tables

Motor size DR.71-DR.100					
Terminal stud diameter	**Tightening torque of hex nut**	**Connection at customer site cross section**	**Version**	**Connection type**	**Scope of delivery**
M4	**1.6 Nm**	**≤ 1.5 mm²**	**Type 1a**	**Massive wire Conductor end sleeve**	**Pre-assembled terminal links**
		≤ 6 mm²	**Type 1b**	**Ring cable lug**	**Pre-assembled terminal links**
		≤ 6 mm²	Type 2	Ring cable lug	Small connection accessories in enclosed bag
M5	2.0 Nm	≤ 10 mm²	Type 2	Ring cable lug	Small connection accessories in enclosed bag
M6	3.0 Nm	≤ 16 mm²	Type 3	Ring cable lug	Small connection accessories in enclosed bag

Motor size DR.112-DR.132					
Terminal stud diameter	**Tightening torque of hex nut**	**Connection at customer site cross section**	**Version**	**Connection type**	**Scope of delivery**
M5	**2.0 Nm**	**≤ 10 mm²**	**Type 2**	**Ring cable lug**	**Connection accessories preassembled**
M6	3.0 Nm	≤ 16 mm²	Type 3	Ring cable lug	Connection accessories preassembled

Motor size DR.160					
Terminal stud diameter	**Tightening torque of hex nut**	**Connection at customer site cross section**	**Version**	**Connection type**	**Scope of delivery**
M6	**3.0 Nm**	**≤ 16 mm²**	**Type 3**	**Ring cable lug**	**Connection accessories preassembled**
M8	6.0 Nm	≤ 25 mm²	Type 3	Ring cable lug	Connection accessories preassembled

Motor size DR.315					
Terminal stud diameter	**Tightening torque of hex nut**	**Connection at customer site cross section**	**Version**	**Connection type**	**Scope of delivery**
M12	**15.5 Nm**	≤ 50 mm²	**Type 3**	**Ring cable lug**	**Connection accessories preassembled**
M16	**30 Nm**	≤ 95 mm²			

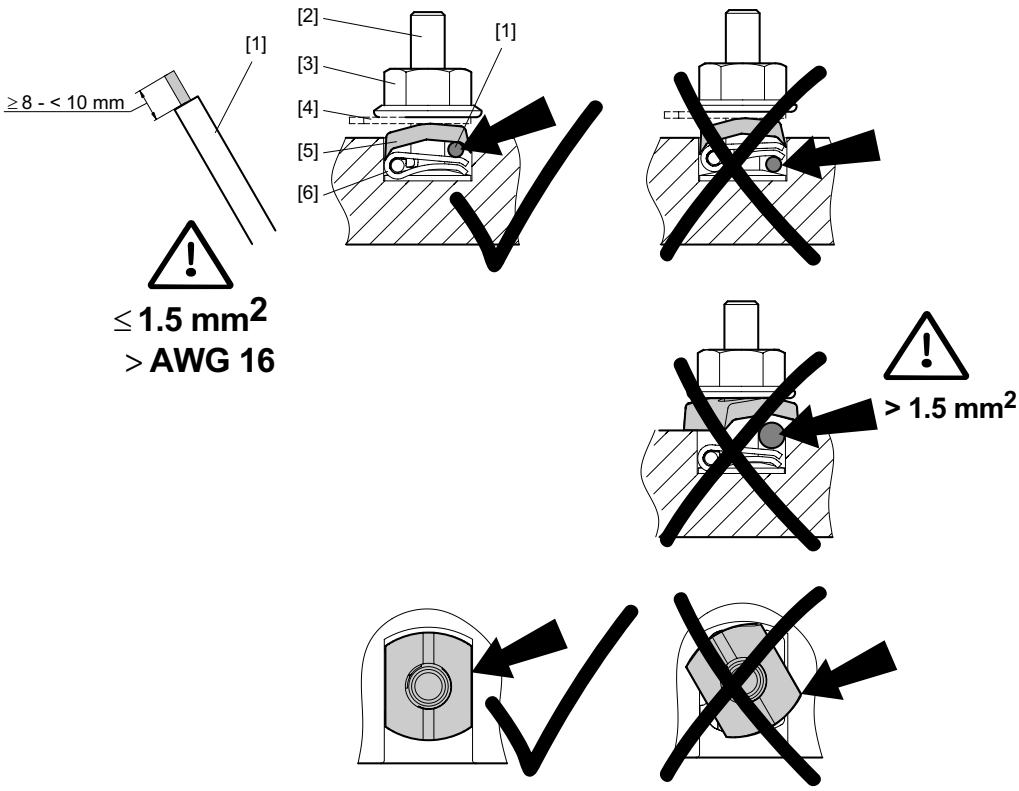
The types printed in bold apply to S1 operation for the standard voltages and standard frequencies according to the data specified in the catalog. Deviating types can have different connections, e.g. different diameters of the terminal studs, and / or a different scope of delivery.

Type 1

a) If the cross section of the external connection is ≤ **1.5 mm²**, it can be installed directly under the terminal washer.

b) If the cross section of the external connection is **> 1.5 mm²**, it must be installed as cable lug under the terminal washer.

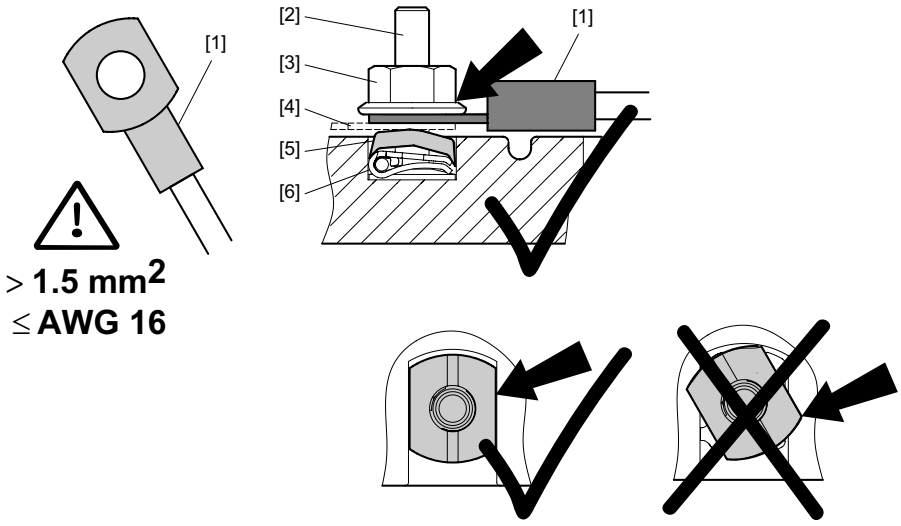
Type 1a: Cross section ≤ 1.5 mm²



88866955

[1] External connection with cross section ≤ 1.5 mm²
[2] Terminal stud
[3] Hexagon nut with flange
[4] Terminal link
[5] Terminal washer
[6] Winding connection with Stocko connection terminal

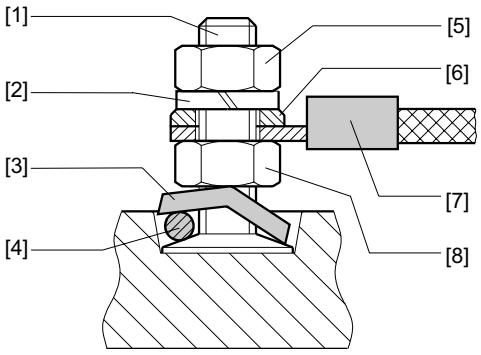
Type 1b: Cross section > 1.5 mm²



88864779

[1] External connection with ring cable lug, for example according to DIN 46237 or DIN 46234
[2] Terminal stud
[3] Hexagon nut with flange
[4] Terminal link
[5] Terminal washer
[6] Winding connection with Stocko connection terminal

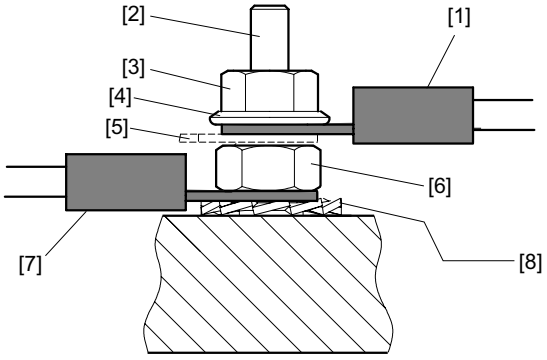
Type 2



185439371

[1] Terminal stud
[2] Lock washer
[3] Terminal washer
[4] Winding connection
[5] Upper nut
[6] Washer
[7] External connection with ring cable lug, for example according to DIN 46237 or DIN 46234
[8] Lower nut

Type 3



199641099

[1] External connection with ring cable lug, for example according to DIN 4637 or DIN 46234
[2] Terminal stud
[3] Upper nut
[4] Washer
[5] Terminal link
[6] Lower nut
[7] Winding connection with ring cable lug
[8] Serrated lock washer

5.8 Connecting the brake

The brake is released electrically. The brake is applied mechanically when the voltage is switched off.

	STOP • Comply with the applicable regulations issued by the relevant employer's liability insurance association regarding phase failure protection and the associated circuit / circuit modification. • Connect the brake according to the wiring diagram supplied with the brake. • In view of the DC voltage to be switched and the high level of current load, it is essential to use either special brake contactors or AC contactors with contacts in utilization category AC-3 to EN 60947-4-1.

5.8.1 Connecting the brake control

The DC disk brake is powered from a brake control system with protection circuit. It is located in the terminal box / IS lower part or must be installed in the control cabinet.

- **Check the cable cross sections – braking currents (see sec. "Technical Data")**
- Connect the brake control system according to the wiring diagram supplied with the brake
- For motors in thermal class 180 (H), install the brake rectifier in the control cabinet

5.9 Accessory equipment

Connect the accessory equipment only as shown in the wiring diagram(s) included with the motor. **Do not connect or start up the accessory equipment if the wiring diagram is missing.** You can obtain the valid wiring diagrams free of charge from SEW-EURODRIVE.

5.9.1 TF temperature sensor

STOP

Do not connect any voltages > 30 V to the TF temperature sensor!

The positive temperature coefficient (PTC) thermistors comply with DIN 44082.

Resistance measurement (measuring instrument with V ≤ 2.5 V or I < 1 mA):

- Standard measured values: 20...500 Ω, thermal resistance > 4,000 Ω

When using the temperature sensor for thermal monitoring, the evaluation function must be activated to maintain reliable isolation of the temperature sensor circuit. If the temperature reaches an excessive level, the thermal protection function must be effective immediately.

5.9.2 TH winding thermostats

The thermostats are connected in series and open when the permitted winding temperature is exceeded. They can be connected in the drive monitoring loop.

	AC V	DC V	
Voltage U [V]	250	60	24
Current (cos φ = 1.0) [A]	2.5	1.0	1.6
Current (cos φ = 0.6) [A]	1.6		
Contact resistance max. 1 ohm at DC 5 V / 1 mA			

5.9.3 V forced cooling fan

- Connection in separate terminal box
- Max. connection cross section 3 × 1.5 mm^2
- Cable gland M16 × 1.5

Motor size	Operating mode / connection	Frequency in Hz	Voltage V
DR.71-DR.160	1 ~ AC (△)	50	230 - 277
DR.71-DR.160	1 ~ AC (△)	60	230 - 277
DR.71-DR.315	3 ~ AC 人	50	346 - 500
DR.71-DR.315	3 ~ AC 人	60	380 - 575
DR.71-DR.315	3 ~ AC △	50	200 - 290
DR.71-DR.315	3 ~ AC △	60	220 - 330

NOTE

For information on how to connect the V forced cooling fan, refer to the wiring diagram (page 88).

5.9.4 Encoder overview

For notes on connecting the incremental encoders, please refer to the wiring diagrams:

Encoder	Motor size	Encoder type	Installation type	Power supply	Signal	Wiring diagram
ES7S	DR.71-DR.132	Encoder	Shaft centered	DC 7..30 V	1 V_{ss} sin/cos	68 169 xx 06[1)]
ES7H	DR.71-DR.132	Encoder	Shaft centered	DC 7.0.12 V	Hiperface® Single-turn	68 170 xx 06[1)]
AS7H	DR.71-DR.132	Encoder	Shaft centered	DC 7.0.12 V	Hiperface® Multi-turn	68 170 xx 06[1)]
EH7S	DR.315	Encoder	Shaft centered	DC 10..30 V	1 V_{ss} sin/cos	08 259 xx 07[1)]
AH7Y	DR.315	Encoder	Shaft centered	DC 9..30 V	TTL + SSI (RS 422)	08 259 xx 07[1)]

1) xx = Placeholder for wiring diagram version

NOTES

- Maximum oscillation load for encoders ≤ 10 g ≈ 100 m/s^2 (10 Hz ... 2 kHz)
- Shock resistance ≤ 100 g ≈ 1,000 m/s^2 for DR.71-DR.132
- Shock resistance ≤ 200 g ≈ 2,000 m/s^2 for the DR.315

5.9.5 Encoder connection

When connecting encoders to inverters, always follow the operating instructions for the relevant inverter.

- Maximum line length (inverter - encoder):
  - 100 m with a capacitance per unit length ≤ 120 nF/km
- Core cross section: 0.20 ... 0.5 mm^2
- Use shielded cable with twisted pair conductors and apply shield over large area on both ends :
  - To the connection cover of the encoder, in the cable gland, or in the encoder plug
  - To the inverter on the electronics shield clamp or to the housing of the sub D plug
- Install the encoder cables separately from the power cables, maintaining a distance of at least 200 mm.

6 Startup

6.1 Prerequisites for startup

	NOTE
	• It is essential to observe the safety notes in section 2 (page 6) during installation. • In case of problems, refer to the section "Malfunctions" (page 89).

6.1.1 Before startup, make sure that:

- The drive is undamaged and not blocked.
- The measures stipulated in section "Preliminary work" (page 13) are performed after extended storage periods.
- All connections have been made properly.
- The direction of rotation of the motor/gearmotor is correct.
  - (motor rotating clockwise: U, V, W to L1, L2, L3)
- All protective covers have been installed correctly.
- All motor protection equipment is active and set for the rated motor current.
- There are no other sources of danger present.

6.1.2 During startup, make sure that:

- The motor is running correctly (no overload, no speed fluctuation, no loud noises, etc.).
- The correct braking torque is set according to the specific application (see section "Technical Data" (page 68)).

	STOP
	On brake motors with self-reengaging manual brake release, the lever must be removed after startup! A bracket is provided for storing the lever on the outside of the motor.

7 Inspection / Maintenance

⚠ DANGER!

Risk of crushing if the hoist falls.
Severe or fatal injuries.
- Secure or lower hoist drives (danger of falling)
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional re-start!
- Use only genuine spare parts according to the valid parts list.
- Always install a new brake controller at the same time as replacing the brake coil.

⚠ CAUTION!

The drive surfaces can reach high temperatures during operation.
Danger of burns.
- Before starting work, let the motor cool down.

STOP

For assembly, the ambient temperature and the oil seals themselves may not be colder than 0°C, since the oil seals could be damaged otherwise.

7.1 Inspection and maintenance intervals

Unit / unit part	Time interval	What to do?
Brake BE	• **If used as a working brake:** At least every 3,000 hours of operation[1)] • **If used as a holding brake:** Every 2 to 4 years, depending on operating conditions [1)]	Inspect the brake • Measure brake disc thickness • Brake disc, lining • Measure and set working air gap • Pressure plate • Carrier / gearing • Pressure rings • Vacuum up the abraded matter • Inspect the switch elements and change if necessary (e.g. in case of burn-out)
Motor	• **Every 10,000 hours of operation**[2)]	Inspect the motor: • Check anti-friction bearings and replace if necessary • Replace the oil seal • Clean cooling air passages
Drive	• Varies (depending on external factors)	• Repair or renew surface / anticorrosion coating

1) The amount of wear is affected by many factors and the service life may be short. The machine designer must calculate the required inspection/maintenance intervals individually in accordance with the project planning documents (e.g. "Project Planning for Drives").

2) For the DR.315 with relubrication device, please note the shortened relubrication periods in sec. "Bearing lubrication DR.315".

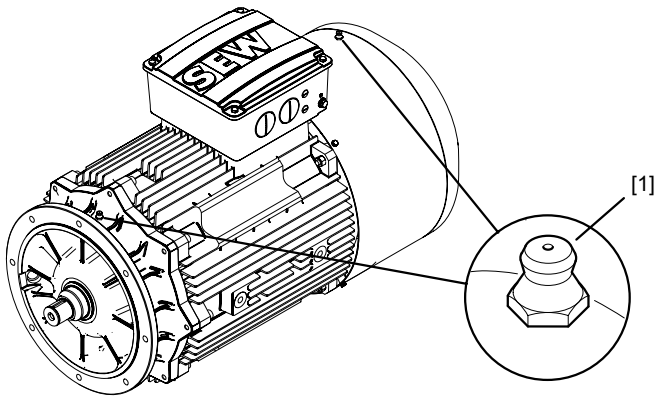
7.2 Bearing lubrication

7.2.1 Bearing lubrication of DR.71-DR.160

The motor bearings are equipped with lifetime lubrication as standard.

7.2.2 Bearing lubrication of the DR.315

Motors of size 315 can be equipped with a relubrication device. The following figure shows the location of the relubrication devices:



375353099

[1] Relubrication device in form A to DIN 71412

For normal operating conditions and an ambient temperature from -20° C to 40° C, SEW-EURODRIVE uses a mineral high-performance grease on poly-urea basis, ESSO Polyrex EM (K2P-20 DIN51825), for the first grease filling.

For motors in the low temperature range down to -40° C, SKF GXN grease is used, another mineral grease on poly-urea basis.

Relubrication

The grease can be ordered in 400 g cartridges as individual part from SEW-EURODRIVE. For order details, refer to sec. "Lubricant tables for anti-friction bearings of SEW motors" (page 80).

	NOTE
	Only mix greases of the same thickening agent, same oil stock and same consistency (NLGI class)!

Grease the motor bearings according to the information on the lubrication plate of the motor. The used grease accumulates in the inside of the motor. It should be removed after 6-8 relubrication cycles within the context of an inspection. When replacing the grease in the bearings, make sure that the bearing is filled two thirds roughly.

After relubrication, start up the motors slowly if possible to distribute the grease evenly.

Relubrication period

The relubrication period of the bearings for

- -20°C...40°C ambient temperature
- 4-pole speed
- and normal load

can be determined from the table below. Higher speeds, loads or ambient temperatures cause shorter relubrication periods.

	Horizontal mounting position		Vertical mounting position	
Motor type	**Duration**	**Quantity**	**Duration**	**Quantity**
DR.315 /NS	5,000 h	50 g	3,000 h	70 g
DR.315 /ERF /NS	3,000 h	50 g	2,000 h	70 g

7.3 Reinforced bearing

STOP

In option /ERF (reinforced bearing), cylindrical roller bearings are used on the A-side. Do not operate them without any overhung loads, since otherwise they might be damaged.

The reinforced bearing is only offered with option /NS (relubrication) to optimize lubrication of the bearings. Please observe the notes on bearing lubrication in sec. "Bearing lubrication of the DR.315" (page 31) .

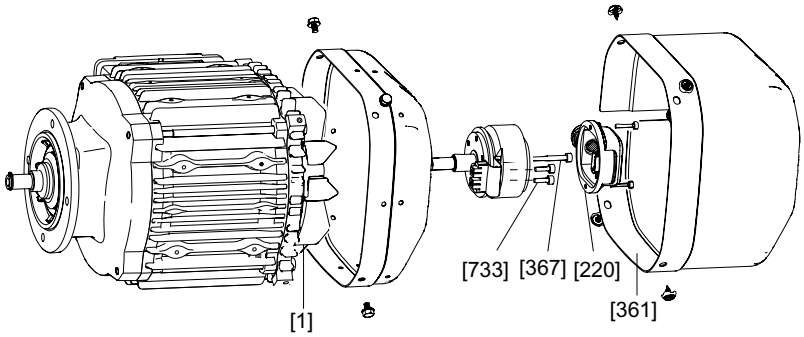
7.4 Preliminary work for motor and brake maintenance

⚠ DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.
- Before starting work, isolate the motor and brake from the power supply.
- Safeguard them against unintentional power-up.

7.4.1 Removing the incremental encoder from DR.71-DR.132

The following figure shows how to remove an encoder using the ES7 incremental encoder as example.



179980299

[1] Rotor
[220] Connection cover
[361] Protective cowl
[367] Retaining bolt
[733] Screws

Removing AS7.

- Remove the protective cowl [361].
- Remove expansion anchor from the cowl grid by unscrewing the screws [733]
- Unscrew the central retaining screw [367] by about two to three turns and loosen the spread shaft by tapping lightly on the head of the screw.
- Remove the incremental encoder from the bore of the rotor [1]

Removing ES7.

- Remove the protective cowl [361].
- Unscrew the connection cover [220] and remove it. The encoder connection cable need not be disconnected.
- Remove expansion anchor from the cowl grid by unscrewing the screws [733].
- Unscrew the central retaining screw [367] by about two to three turns and loosen the spread shaft by tapping lightly on the head of the screw.
- Remove the incremental encoder from the bore of the rotor [1]

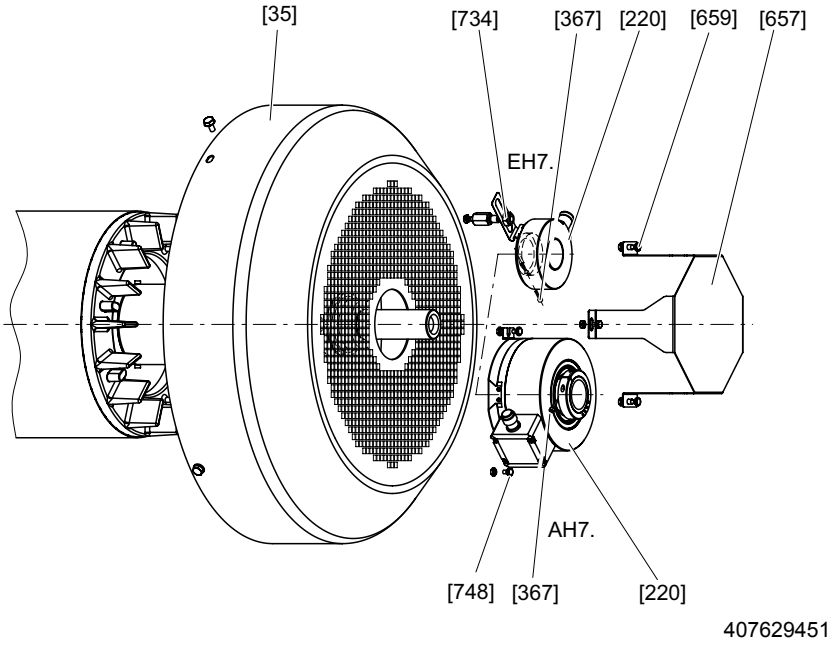
Re-assembly

Important for re-assembly:

- Apply NOCO® fluid to the encoder spigot.
- Tighten the central retaining screw [367] with a tightening torque of to 2.9 Nm.
- Tighten screw [733] in expansion anchor with a tightening torque of max. -1.0 Nm.

7.4.2 Removing incremental encoder from DR.315

The following figure shows the disassembly of the incremental encoder on the DR.315



[35] Fan guard
[220] Encoder
[367] Retaining bolt
[657] Protective cowl
[659] Screw
[734] Nut
[748] Screw

Removing EH7.

- Remove protective cowl [657] by unscrewing the screws [659].
- Remove encoder from the fan guard by unscrewing the nut [734].
- Loosen retaining screw [367] on the encoder [220] and remove [220] encoder from the shaft.

Removing AH7.

- Remove protective cowl [657] by unscrewing the screws [659].
- Remove encoder from the fan guard by unscrewing the screws [748].
- Loosen retaining screw [367] on the encoder [220] and remove [220] encoder from the shaft.

Re-assembly

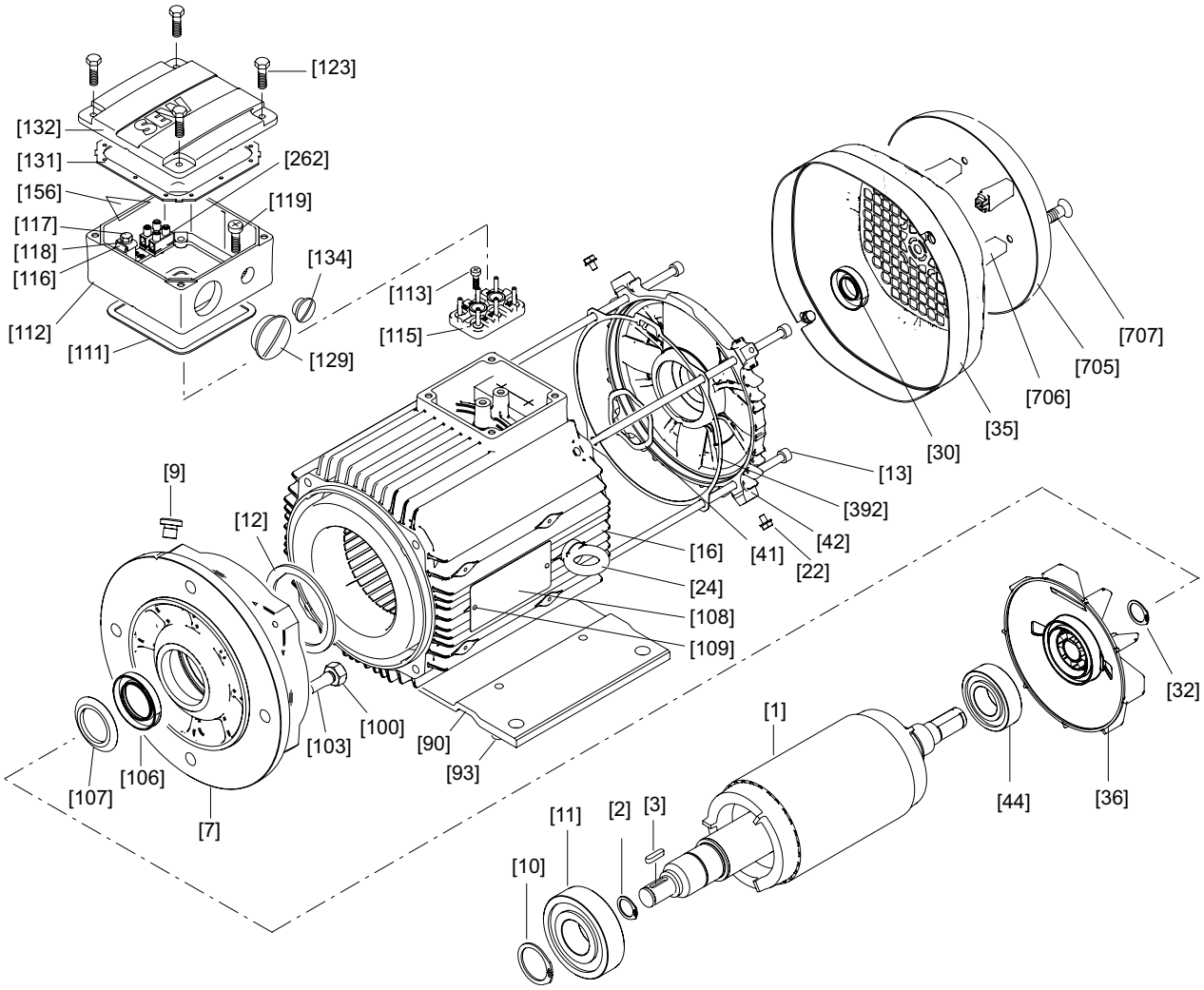
Important for re-assembly:

- Apply NOCO® fluid to the encoder spigot.
- Tighten retaining screw with the following tightening torques:

Encoder	Tightening torque
EH7.	0.7 Nm
AH7.	3.0 Nm

7.5 Inspection and maintenance work on the motor DR71-DR100

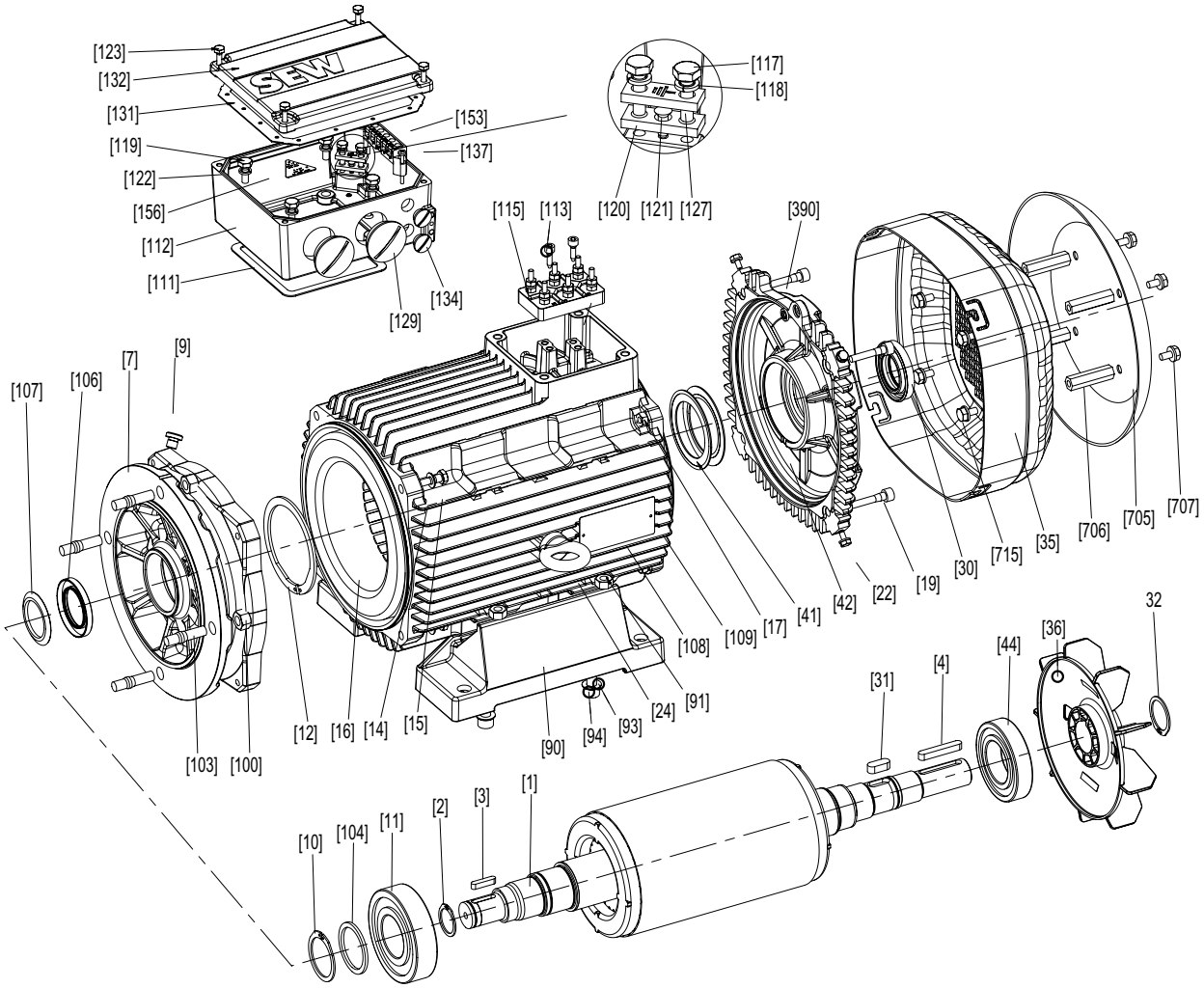
7.5.1 Basic design of DR.71-DR.132



173332747

[1] Rotor
[2] Circlip
[3] Key
[7] Flanged end shield
[9] Screw plug
[10] Circlip
[11] Deep groove ball bearing
[12] Circlip
[13] Machine screw
[16] Stator
[22] Hex head bolt
[24] Lifting eyebolt
[30] Oil seal
[32] Circlip
[35] Fan guard
[36] Fan
[41] Equalizing ring
[42] Non drive-end bearing shield
[44] Grooved ball bearing
[90] Base plate
[93] Pan head screw
[100] Hex nut
[103] Stud
[106] Oil seal
[107] Oil flinger
[108] Nameplate
[109] Grooved pin
[111] Gasket for lower part
[112] Terminal box lower part
[113] Pan head screw
[115] Terminal board
[116] Terminal clip
[117] Hex head bolt
[118] Lock washer
[119] Pan head screw
[123] Hex head bolt
[129] Screw plug with O-ring
[131] Gasket for cover
[132] Terminal box cover
[134] Screw plug with O-ring
[156] Information sign
[262] Terminal clip, complete
[392] Gasket
[705] Protection canopy
[706] Spacer
[707] Pan head screw

7.5.2 Basic design of the DR.160



527322635

[1]	Rotor	[36]	Fan	[119]	Hex head bolt
[2]	Circlip	[41]	Spring washer	[120]	Grounding terminal bottom
[3]	Key	[42]	Non drive-end bearing shield	[121]	Grooved pin
[4]	Key	[44]	Deep groove ball bearing	[122]	Lock washer
[7]	Flange	[90]	Foot	[123]	Hex head bolt
[9]	Screw plug	[91]	Hexagonal nut	[127]	Grounding terminal top
[10]	Circlip	[93]	Disc	[129]	Screw plug with O-ring
[11]	Deep groove ball bearing	[94]	Machine screw	[131]	Gasket for cover
[12]	Circlip	[100]	Hexagonal nut	[132]	Terminal box cover
[14]	Disc	[103]	Stud	[134]	Screw plug with O-ring
[15]	Hex head bolt	[106]	Oil seal	[137]	Bolt
[16]	Stator	[107]	Oil-flinger ring	[153]	Terminal strip, complete
[17]	Hexagonal nut	[108]	Nameplate	[156]	Information sign
[19]	Machine screw	[109]	Grooved pin	[390]	O-ring
[22]	Hex head bolt	[111]	Seal for bottom part	[705]	Protection canopy
[24]	Lifting eyebolt	[112]	Terminal box lower part	[706]	Spacer
[30]	Sealing ring	[113]	Bolt	[707]	Hex head bolt
[31]	Key	[115]	Terminal board	[715]	Hex head screw
[32]	Circlip	[117]	Hex head bolt		
[35]	Fan guard	[118]	Lock washer		

7.5.3 Inspection steps for DR.71-DR.160 motors

⚠ DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.
- Disconnect the motor from the power supply before starting work and protect it against unintentional re-start!
- Strictly observe the following instructions!

1. Remove forced cooling fan and incremental encoder, if installed.

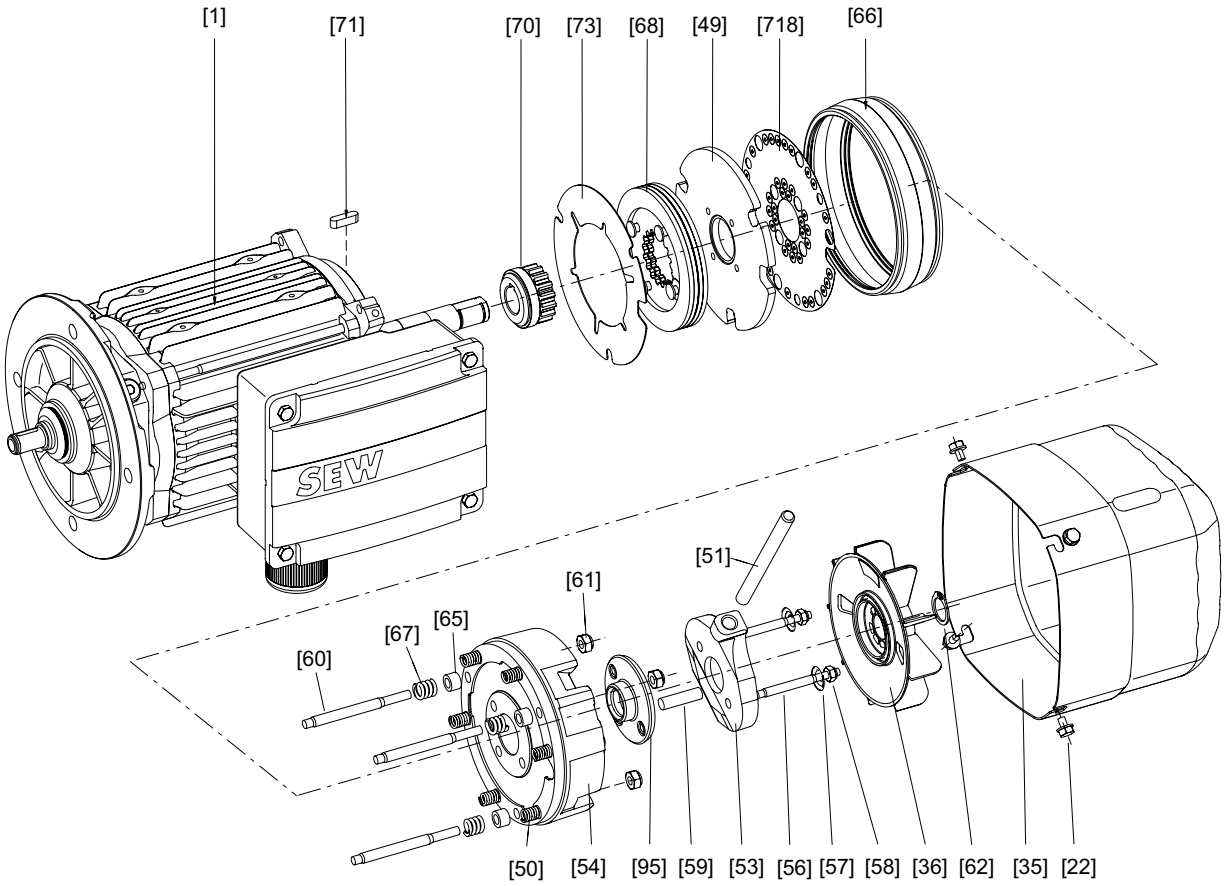
   See sec. "Preliminary work for motor and brake maintenance" (page 33).
2. Remove fan guard [35] and fan [36].
3. Remove stator:
   - Size DR.71-DR.132: Remove machine screws [13] from flanged endshield [7] and B-side endshield [42]. Remove stator [16] from flanged endshield [7].
   - Size DR.160: Loosen hex head screw [19] and remove B-side endshield [42]. Loosen hex head screw [15] and remove stator from flanged endshield.
4. Visual inspection: Is there any moisture or gear unit oil inside the stator?
   - If not, continue with 7
   - If there is condensation, continue with 5
   - If there is gear oil, have the motor repaired by a specialist workshop
5. If there is moisture inside the stator:
   - With gearmotors: Remove the motor from the gear unit
   - Motors without a gear unit: Remove the A-flange
   - Remove the rotor [1]
6. Clean the winding, dry it and check it electrically (see sec. "Preliminary work" (page 13)).
7. Replace deep groove ball bearings [11], [44] with permitted ball bearings.

   See sec. "Permitted anti-friction bearing types" (page 79).
8. Replace the shaft sealing:
   - A-end: Replace oil seal [106]
   - B-end: Replace oil seal [30]

     Apply grease (Klüber Petamo GHY 133) to the sealing lip.
9. Replace the stator seat sealing:
   - Seal the sealing surface with duroplastic sealing compound (operating temperature -40...180 °C), such as "Hylomar L Spezial".
   - For size DR.71-DR.132: Replace gasket [392].
10. Install the motor and accessories.

7.6 Inspection and maintenance for DR71-DR100 brake motors

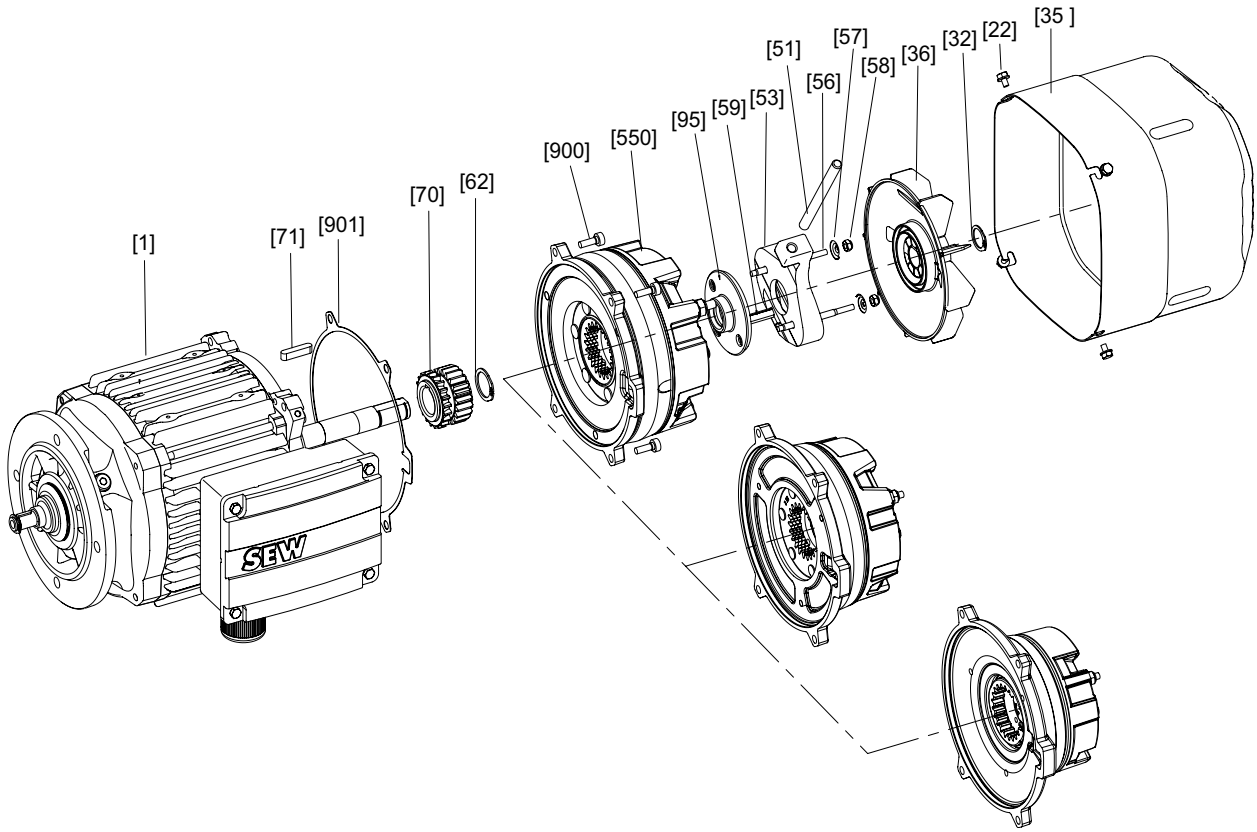
7.6.1 Basic design of DR.71-DR.80 brakemotors



174200971

[1] Motor with brake bearing end shield
[22] Hex head bolt
[35] Fan guard
[36] Fan
[49] Pressure plate
[50] Brake spring
[11] Magnet, complete
[51] Hand lever
[53] Releasing lever
[54] Magnet, complete
[56] Stud
[57] Conical spring
[58] Setting nut
[59] Parallel pin
[60] Stud 3x
[61] Hex nut
[65] Pressure ring
[66] Rubber sealing collar
[67] Counter spring
[68] Brake disc
[62] Circlip
[70] Driver
[71] Key
[73] Stainless steel shim plate
[95] Sealing ring
[718] Damping plate

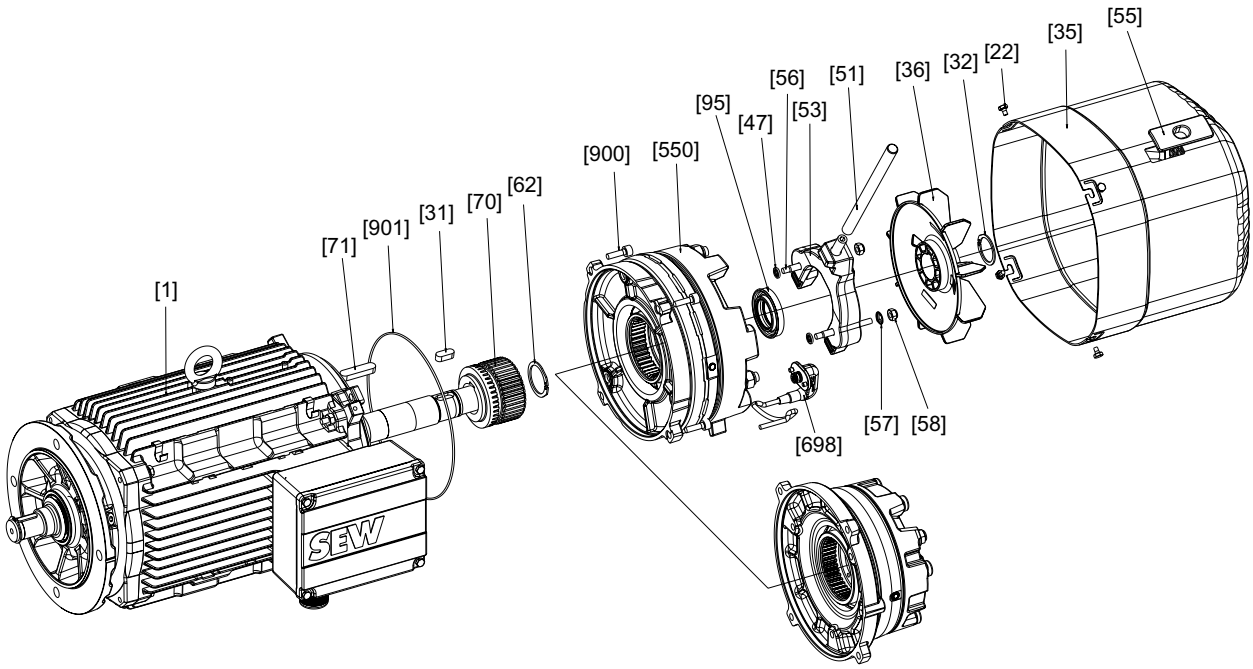
7.6.2 Basic design of DR.90-DR.132 brakemotors



179981963

[1] Motor with brake bearing end shield
[22] Hex head bolt
[32] Circlip
[35] Fan guard
[36] Fan
[51] Hand lever
[53] Releasing lever
[56] Stud
[57] Conical coil spring
[58] Setting nut
[59] Parallel pin
[62] Circlip
[70] Carrier
[95] Sealing ring
[550] Pre-assembled brake
[900] Screw
[901] Gasket

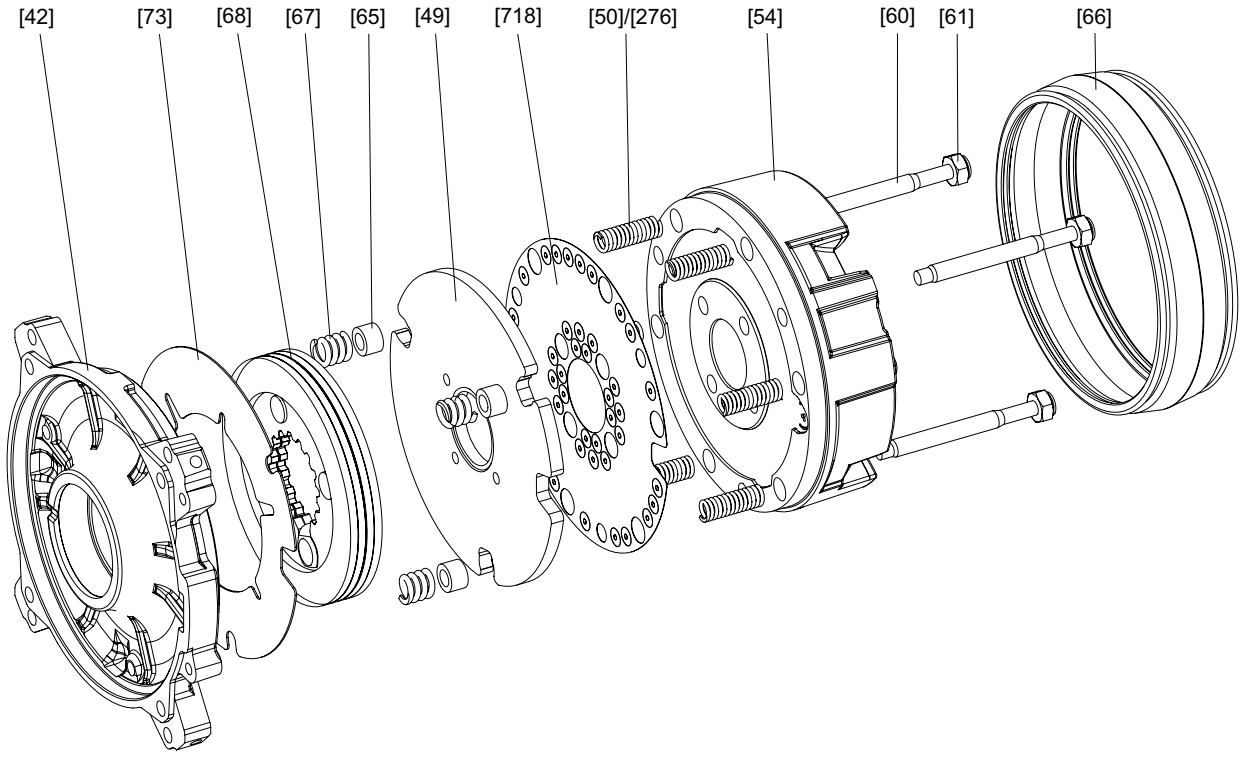
7.6.3 Basic design of DR.160 brakemotor



527223691

[1] Motor with brake bearing end shield
[22] Hex head bolt
[31] Key
[32] Circlip
[35] Fan guard
[36] Fan
[51] Hand lever
[53] Releasing lever
[55] Closing piece
[56] Stud
[57] Conical coil spring
[58] Setting nut
[62] Circlip
[70] Carrier
[71] Key
[95] Sealing ring
[550] Pre-assembled brake
[698] Plug connector complete (only for BE20)
[900] Screw
[901] O-ring

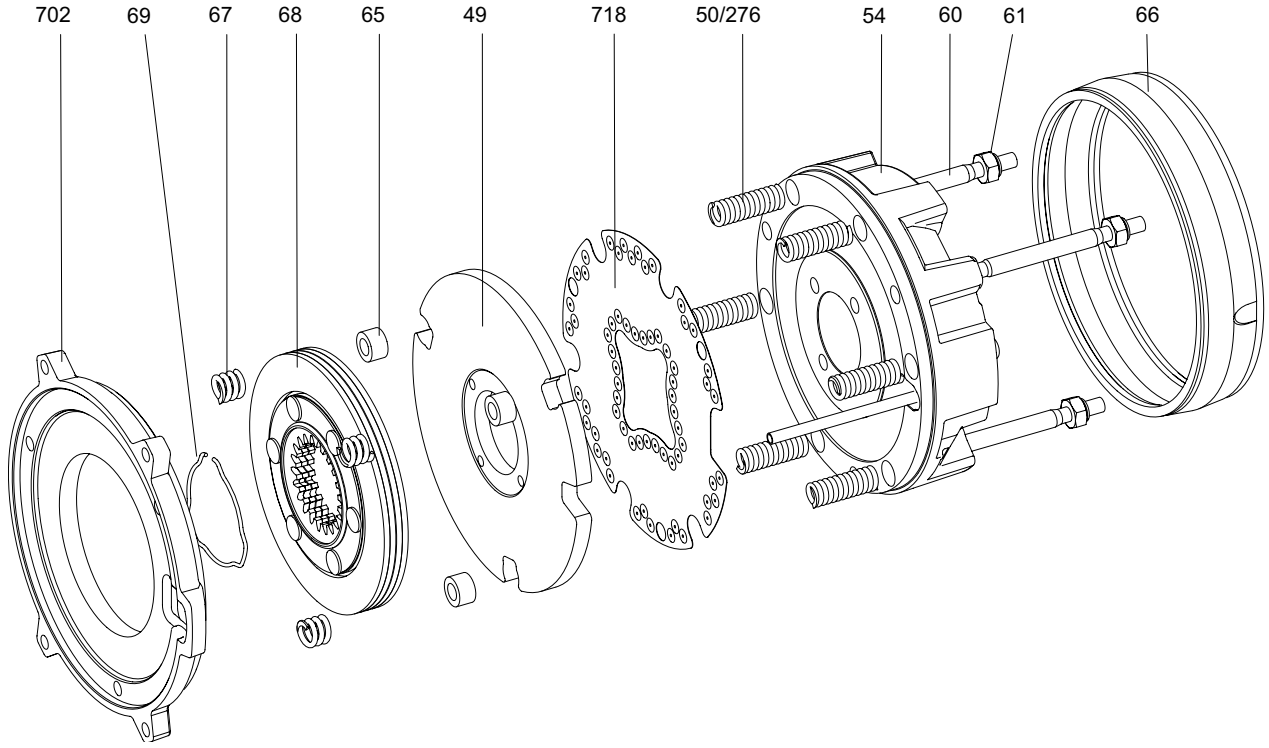
7.6.4 Basic design of BE05-BE2 brake (DR.71-DR.80)



528377739

[42] Brake endshield
[49] Pressure plate
[50] Brake spring (standard)
[54] Magnet, complete
[60] Stud 3x
[61] Hexagonal nut
[65] Pressure ring
[66] Rubber sealing collar
[67] Counter spring
[68] Brake disk
[73] Niro disk
[276] Brake spring (blue)
[718] Dampening plate

7.6.5 Basic design of BE1-BE20 brake (DR.90-DR.160)



174202635

[49] Pressure plate
[50] Brake spring (standard)
[54] Magnet, complete
[60] Stud 3x
[61] Hexagonal nut
[65] Pressure ring
[66] Rubber sealing collar
[67] Counter spring
[68] Brake disk
[69] Circular spring
[276] Brake spring (blue)
[702] Friction disk
[718] Dampening plate

7.6.6 Inspection steps for DR.71-DR.160 brakemotors

⚠ DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove forced cooling fan and incremental encoder, if installed.

   See sec. "Preliminary work for motor and brake maintenance" (page 33).
2. Remove fan guard [35] and fan [36].
3. Remove stator:
   - Size DR.71-DR.132: Remove machine screws [13] from flanged endshield [7] and B-side endshield [42]. Remove stator [16] from flanged endshield [7].
   - Size DR.160: Loosen hex head screw [19] and remove B-side endshield [42]. Loosen hex head screw [15] and remove stator from flanged endshield.
4. Removing the brake cable:
   - Size DR.71-DR.132: Remove the terminal box cover, loosen the brake cable from the rectifier.
   - Size DR.160: Loosen safety screws of the brake plug connector [698] and remove plug connector.
5. Press off the brake from the stator and remove it carefully.
6. Pull the stator back by approx. 3 to 4 cm.
7. Visual inspection: Is there any moisture or gear unit oil inside the stator?
   - If not, continue with 10
   - If there is condensation, continue with 8
   - If there is gear oil, have the motor repaired by a specialist workshop
8. If there is moisture inside the stator:
   - With gearmotors: Remove the motor from the gear unit
   - Motors without a gear unit: Remove the A-flange
   - Remove the rotor [1]
9. Clean the winding, dry it and check it electrically (see sec. "Preliminary work" (page 13)).

10. Replace deep groove ball bearings [11], [44] with permitted ball bearings.

    See sec. "Permitted anti-friction bearing types" (page 79).

11. Replace the shaft sealing:
    - A-end: Replace oil seal [106]
    - B-end: Replace oil seal [30]

      Apply grease (Klüber Petamo GHY 133) to the sealing lip.

12. Replace the stator seat sealing:
    - Seal the sealing surface with duroplastic sealing compound (operating temperature -40...180 °C), such as "Hylomar L Spezial".
    - For size DR.71-DR.132: Replace gasket [392].

13. Install the motor, brake and accessories.

7.6.7 Setting the working air gap of BE05-BE20 brakes

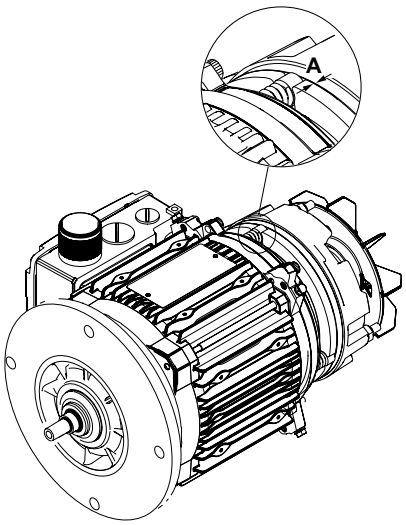
⚠ DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove the following:
   - Forced cooling fan and incremental encoder, if installed

     See sec. "Preliminary work for motor and brake maintenance" (page 33).
   - Flange cover or fan guard [21]
2. Push the rubber sealing collar [5] aside,
   - if necessary, release the clip
   - Vacuum up the abraded matter
3. Measure the brake disk [68]:
   - Minimum brake disk thickness see sec. "Technical Data" (page 68).
   - Replace brake disk if necessary, see sec. "Replacing the brake disk of brakes BE05-BE20" (page 46).
4. Measure the working air gap A (see the following figure)

   (use a feeler gauge and measure at three points offset by 120°)
   - Between the pressure plate [49] and damping plate [718]
5. Tighten the hexagon nuts [61]:
6. Tighten the setting sleeves
   - Until the working air gap is set correctly, see sec. "Technical Data" (page 68).
7. Install the rubber sealing collar back in place and re-install the dismantled parts.



179978635

7.6.8 Replacing the brake disk of BE05-BE20 brakes

When changing a brake disk, inspect the other removed parts as well and fit new ones if necessary.

⚠ DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

NOTES

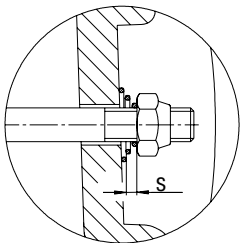
- The brake of DR.71-DR.80 motor sizes cannot be removed from the motor because the BE brake is directly installed on the brake endshield of the motor.
- The brake of DR.90-DR.160 motor sizes cannot be removed from the motor for replacing the brake disk because the BE brake is pre-installed on the brake endshield of the motor with a friction disk .

1. Remove the following:
   - Forced cooling fan and incremental encoder, if installed

     See sec. "Preliminary work for motor and brake maintenance" (page 33).
   - Flange cover or fan guard [35], circlip [32/62] and fan [36]
2. Removing the brake cable
   - Size DR.71...-DR.132: Remove the terminal box cover, loosen the brake cable from the rectifier.
   - Size DR.160: Loosen safety screws of the brake plug connector [698] and remove plug connector.
3. Remove the rubber sealing collar [66]
4. Loosen hex nuts [61], carefully pull off the magnet [54] (brake cable!) and take out the brake springs [50].
5. Remove the damping plate [718], pressure plate [49] and brake disc [68], and clean the brake components.
6. Install a new brake disk.
7. Re-install the brake components.
   - Except for the fan and the fan guard, because the working air gap has to be set first, see section "Setting the working air gap of the BE05-BE20 brakes" (page 45).

8. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



177241867

Brake	Floating clearance s [mm]
BE05; BE1; BE2	1.5
BE5; BE11, BE20	2

9. Install the rubber sealing collar back in place and re-install the dismantled parts.

NOTES

- The lockable manual brake release (type HF) is already released if resistance is encountered when operating the grub screw.
- The self-reengaging manual brake release (type HR) can be operated with normal hand pressure.
- In brake motors with self-reengaging manual brake release, the manual brake release lever must be removed after startup/maintenance! A bracket is provided for storing the lever on the outside of the motor.

NOTES

Important: After replacing the brake disc, the maximum braking torque is reached only after several cycles.

7.6.9 Changing the braking torque of BE05-BE20 brakes

The braking torque can be changed in steps

- By the type and number of brake springs.
- By changing the complete magnet (only possible for BE05 and BE1).
- By changing the brake (from motor size DR.90).

For the possible braking torque steps, please refer to sec. "Technical Data" (page 68).

Changing the brake spring

⚠ DANGER!

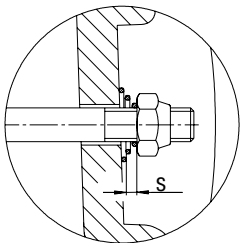
Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove the following:
   - Forced cooling fan and incremental encoder, if installed

     See sec. "Preliminary work for motor and brake maintenance" (page 33).
   - Flange cover or fan guard [35], circlip [32/62] and fan [36]
2. Removing the brake cable
   - Size DR.71...-DR.132: Remove the terminal box cover, loosen the brake cable from the rectifier.
   - Size DR.160: Loosen safety screws of the brake plug connector [698] and remove plug connector.
3. Remove the rubber sealing collar [66] and the manual brake release:
   - Setting nuts [58], conical coil springs [57], studs [56], release lever [53], dowel pin [59]
4. Loosen hex nuts [61], pull off the magnet [54]
   - by approx. 50 mm (watch the brake cable!)
5. Change or add brake springs [50/276]
   - Arrange brake springs symmetrically
6. Re-install the brake components
   - Except for the fan and the fan guard, because the working air gap has to be set first, see section "Setting the working air gap of the BE05-BE20 brakes" (page 45).

7. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



177241867

Brake	Floating clearance s [mm]
BE05; BE1; BE2	1.5
BE5; BE11, BE20	2

8. Install the rubber sealing collar back in place and re-install the dismantled parts.

	NOTE
	Replace setting nuts [58] and hexagon nuts [61] if the removal procedure is repeated.

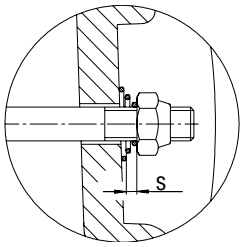
Changing the magnet

⚠ DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove the following:
   – Forced cooling fan and incremental encoder, if installed
   See sec. "Preliminary work for motor and brake maintenance" (page 33).
   – Flange cover or fan guard [35], circlip [32/62] and fan [36]
2. Remove the rubber sealing collar [66] and the manual brake release:
   – Setting nuts [58], conical coil springs [57], studs [56], release lever [53]
3. Removing the brake cable
   – Size DR.71...-DR.132: Remove the terminal box cover, loosen the brake cable from the rectifier.
   – Size DR.160: Loosen safety screws of the brake plug connector [698] and remove plug connector.
4. Loosen hex nuts [61], remove complete magnet [54], replace brake springs [50/276].
5. Re-install the brake components
   – Except for the fan and the fan guard, because the working air gap has to be set first, see section "Setting the working air gap of the BE05-BE20 brakes" (page 45).
6. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



177241867

Brake	Floating clearance s [mm]
BE05; BE1; BE2	1.5
BE5; BE11, BE20	2

7. Install the rubber sealing collar back in place and re-install the dismantled parts.

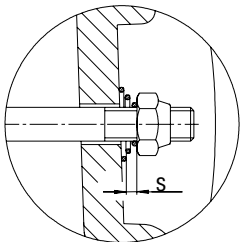
Changing the brake of DR.71 and DR.80

⚠ DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove the following:
   – Forced cooling fan and incremental encoder, if installed
     See sec. "Preliminary work for motor and brake maintenance" (page 33).
   – Flange cover or fan guard [35], circlip [32/62] and fan [36]
2. Remove the terminal box cover and loosen the brake cable from the rectifier. If necessary, attach trailing wire to brake cables.
3. Loosen machine screws [13], remove brake endshield with brake from stator.
4. Insert brake cable into the terminal box.
5. Align the cam of the brake endshield.
6. Install seal [95].
7. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



177241867

Brake	Floating clearance s [mm]
BE05; BE1; BE2	1.5
BE5; BE11, BE20	2

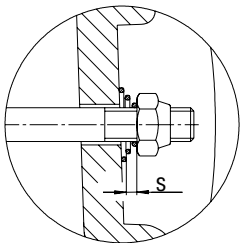
Changing the brake of DR.90 to DR.160

⚠ DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove the following:
   – Forced cooling fan and incremental encoder, if installed
   See sec. "Preliminary work for motor and brake maintenance" (page 33).
   – Flange cover or fan guard [35], circlip [32/62] and fan [36]
2. Removing the brake cable
   – Sizes DR.90...DR.132: Remove the terminal box cover, loosen the brake cable from the rectifier.
   – Size DR.160: Loosen safety screws of the brake plug connector [698] and remove plug connector.
3. Loosen the bolts [900] and remove the brake from the brake endshield.
4. Make sure the seal [901] is aligned properly.
5. Connect brake cable.
6. Align the cam of the friction disc.
7. Install seal [95].
8. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



177241867

Brake	Floating clearance s [mm]
BE05; BE1; BE2	1.5
BE5; BE11, BE20	2

7.6.10 Retrofitting HR/HF manual brake release

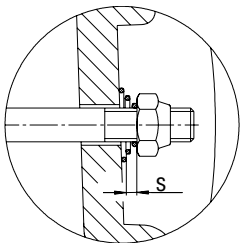
⚠ DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove the following:
   - Forced cooling fan and incremental encoder, if installed

     See sec. "Preliminary work for motor and brake maintenance" (page 33).
   - Flange cover or fan guard [35], circlip [32/62] and fan [36]
2. Installing manual brake release:
   - For size DR.71-DR.132:
     - Remove the sealing ring [95]
     - Screw in studs [56], insert sealing ring for manual brake release [95] and hammer in parallel pin [59].
     - Mount release lever [53], conical coil springs [57] and setting nuts [58].
   - For size DR.160:
     - Screw in studs [56].
     - Mount release lever [53], conical coil springs [57] and setting nuts [58].
3. Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



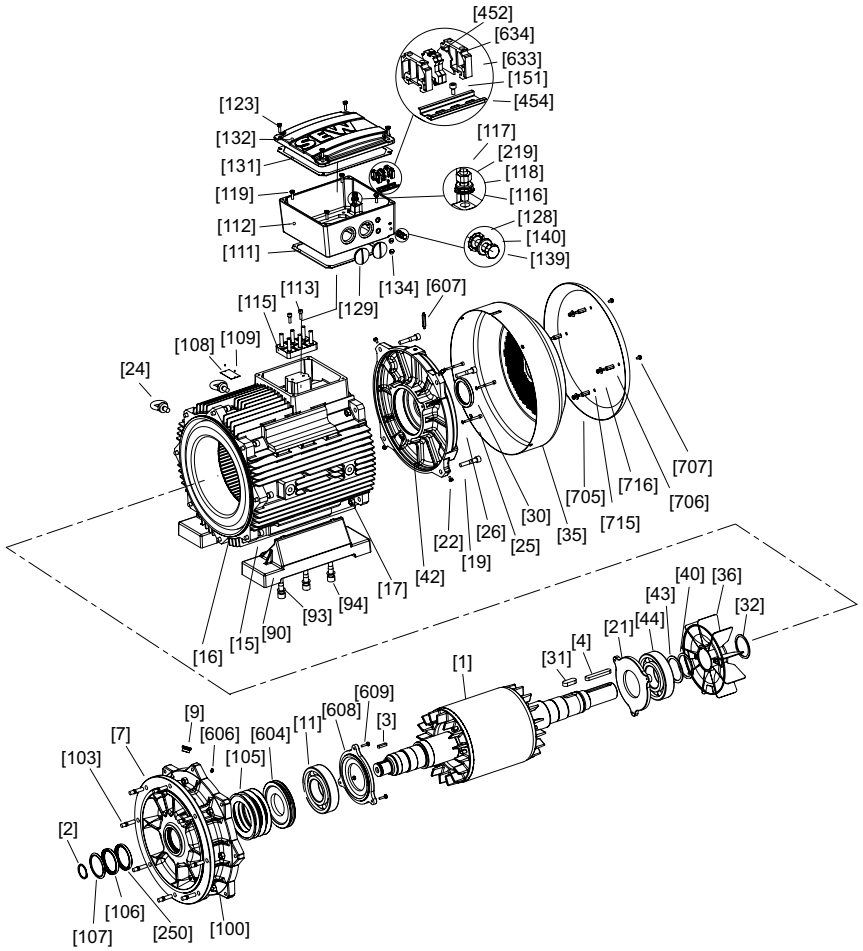
177241867

Brake	Floating clearance s [mm]
BE05; BE1; BE2	1.5
BE5; BE11, BE20	2

4. Install the removed parts again.

7.7 Inspection and maintenance work on the DR315 motor

7.7.1 Basic design of the DR.315 motor



351998603

[1] Rotor
[2] Circlip
[3] Key
[4] Key
[7] Flange
[9] Screw plug
[11] Rolling element bearings
[15] Machine screw
[16] Stator
[17] Hexagonal nut
[19] Machine screw
[21] Oil seal flange
[22] Hex head bolt
[24] Lifting eyebolt
[25] Machine screw
[26] Sealing washer
[30] Oil seal
[31] Key
[32] Circlip
[35] Fan guard
[36] Fan
[40] Circlip
[42] Non drive-end bearing shield
[43] Supporting ring
[44] Rolling element bearings
[90] Foot
[93] Disc
[94] Machine screw
[100] Hex nut
[103] Stud
[105] Spring washer
[106] Oil seal
[107] Oil flinger
[108] Nameplate
[109] Grooved pin
[111] Gasket for lower part
[112] Terminal box lower part
[113] Machine screw
[115] Terminal board
[116] Serrated lock washer
[117] Stud
[118] Washer
[119] Hex head screw
[123] Hex head screw
[128] Serrated lock washer
[129] Screw plug
[131] Gasket for cover
[132] Terminal box cover
[134] Screw plug
[139] Hex head screw
[140] Washer
[151] Machine screw
[219] Hex nut
[250] Oil seal
[452] Terminal strip
[454] DIN rail
[604] Oiling ring
[606] Grease nipple
[607] Grease nipple
[608] Oil seal flange
[609] Hex head screw
[633] End holder
[634] End plate
[705] Protection canopy
[706] Spacer bolt
[707] Hex head screw
[715] Hex nut
[716] Washer

7.7.2 Inspection steps for DR.315

⚠ DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.
- Disconnect the motor from the power supply before starting work and protect it against unintentional re-start!
- Strictly observe the following instructions!

1. Remove forced cooling fan and incremental encoder, if installed.

   See sec. "Preliminary work for motor and brake maintenance" (page 33).

   With gearmotors: Remove the motor from the gear unit.
2. Remove fan guard [35] and fan [36].
3. Loosen hex head screws [25] and [19] and remove B-side endshield [42].
4. Remove machine screws [15] from the flange [7]. Remove rotor [1] completely together with the flange. For gearmotors, remove oil flinger [107].
5. Loosen screws [609] and remove rotor from the flange [7]. Before disassembly, protect oil seal seat against damage, e.g. with tape or a protective sleeve.
6. Visual inspection: Is there any moisture or gear unit oil inside the stator?
   - If not, continue with 8
   - If there is condensation, continue with 7
   - If there is gear oil, have the motor repaired by a specialist workshop
7. If there is moisture inside the stator:

   Clean the winding, dry it and check it electrically (see sec. "Preliminary work" (page 13)).
8. Replace anti-friction bearings [11], [44] with permitted anti-friction bearing types.

   See sec. "Permitted anti-friction bearing types" (page 79).

   Fill bearings about two thirds full with grease.

   See sec. "Bearing lubrication DR.315". (page 31)

   Important: Place sealing ring flanges [608] and [21] on the rotor shaft before mounting the bearings.
9. Assemble the motor by aligning it vertically, A-side up.
10. Insert cup springs [105] and lubricating ring [604] in the bearing bore of the flange [7].

    Suspend rotor [1] from the B-side thread and insert into the flange [7].

    Attach sealing ring flange [608] on the flange [7] using hex head screws [609].

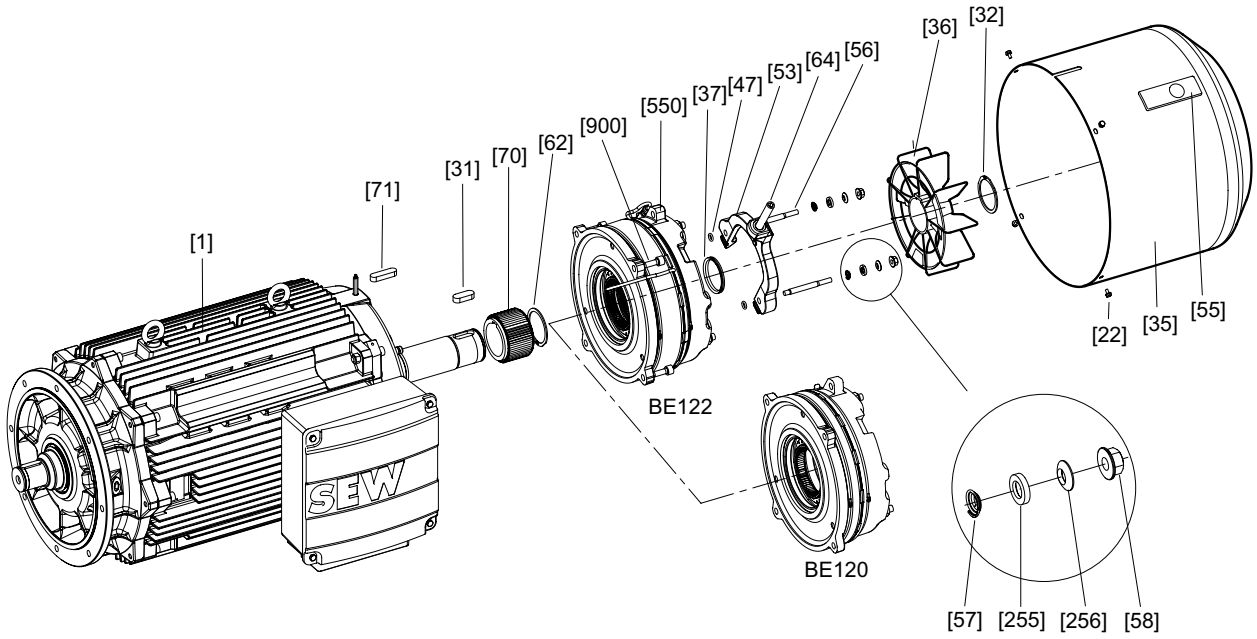
11. Install stator [16].
    - Replace the stator seat sealing: Seal the sealing surface with duroplastic sealing compound (operating temperature -40...180 °C), such as "Hylomar L Spezial".

      Important: Protect winding overhang from damage!
    - Screw in the stator [16] and flange [7] with screws [15].
12. Before mounting the B-side endshield [42], screw in the M8 setscrew approximately 200 mm (7.87 in) into the oil seal flange [21].
13. Mount the B-side endshield [42], feed the setscrew in through a bore for the screw [25]. Screw in the B-side endshield [42] and stator [16] using machine screws [19] and hex nuts [17]. Lift the oil seal flange [21] with the setscrew, and fasten using 2 screws [25]. Remove the setscrew and screw in the remaining screws [25].
14. Renew oil seals
    - A-end: Insert the oil seal [106] and the oil seal [250] for gearmotors.

      With gearmotors, fill the space between the two oil seals approx. two-thirds full with grease (Klüber Petamo GHY133).
    - B-end: Insert the oil seal [30], and coat the sealing lip with the same grease.
15. Reinstall the fan [36] and fan guard [35].

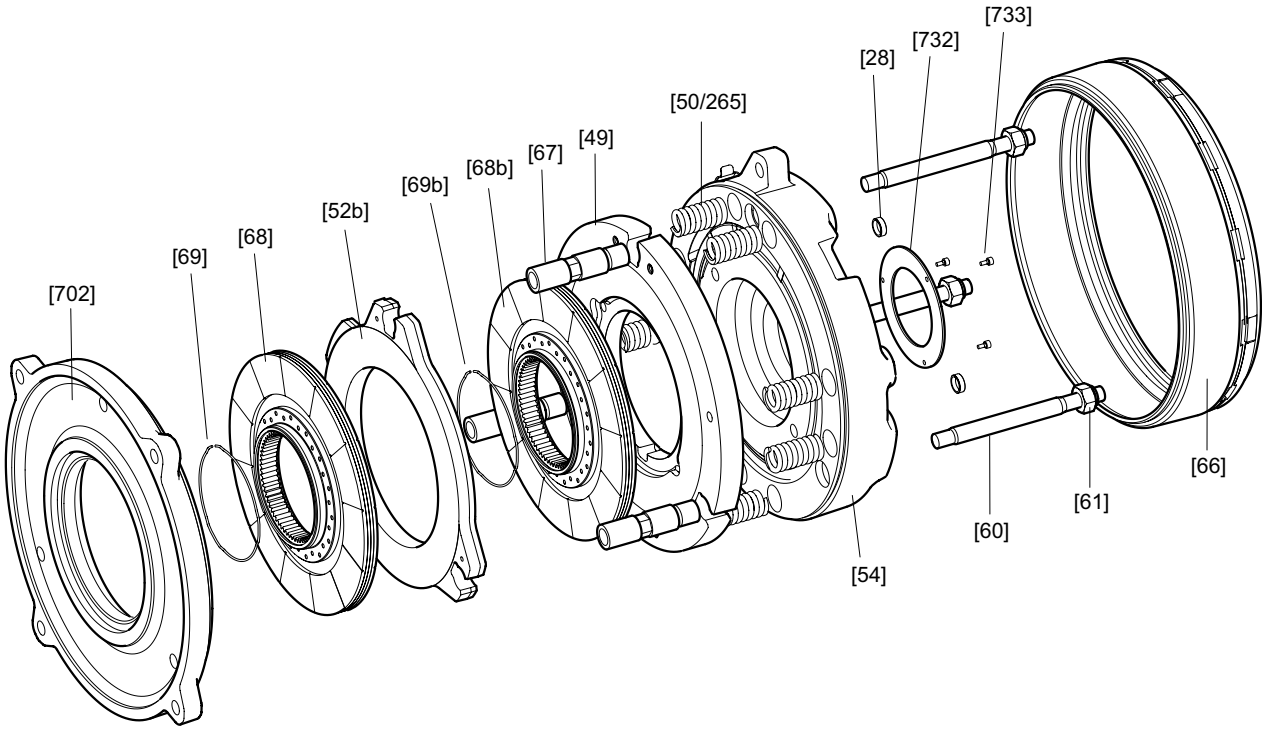
7.8 Inspection and maintenance for DR315 brake motor

7.8.1 Basic design of the DR.315 brakemotor



[1] Motor with brake bearing end shield
[22] Hex head bolt
[31] Key
[32] Circlip
[35] Fan guard
[36] Fan
[37] V-ring
[47] O-ring
[53] Release lever
[55] Closing piece
[56] Stud
[57] Conical spring
[58] Setting nut
[62] Circlip
[64] Setscrew
[70] Driver
[71] Key
[255] Ball cup
[256] Concave washer
[550] Pre-assembled brake
[900] Bolt
[901] Gasket

7.8.2 Basic design of BE120-BE122 brakes



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[28]	Closing cap	[66]	Rubber sealing collar	[702]	Friction disc
[49]	Pressure plate	[67]	Setting sleeve	[732]	Cover disc
[50]	Brake spring	[68]	Brake disc	[733]	Bolt
[52b]	Brake lining (only for BE122)	[68b]	Brake disk (only BE122)		
[54]	Magnet, complete	[69]	Circular spring		
[60]	Stud 3x	[69b]	Circular spring (only BE122)		
[61]	Hexagonal nut	[256]	Brake spring		

7.8.3 Inspection steps DR.315 brakemotor

⚠ DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove forced cooling fan and incremental encoder, if installed

   See sec. "Preliminary work for motor and brake maintenance" (page 33).
2. Remove fan guard [35] and fan [36]
3. Loosen brake connector
4. Loosen the bolts [900] and remove the pre-assembled brake from the brake endshield.
5. Loosen hex head screws [25] and [19] and remove B-side endshield [42].
6. Remove machine screws [15] from the flange [7]. Remove rotor [1] completely together with the flange. For gearmotors, remove oil flinger [107].
7. Loosen screws [609] and remove rotor from the flange [7]. Before disassembly, protect oil seal seat against damage, e.g. with tape or a protective sleeve.
8. Visual inspection: Is there any moisture or gear unit oil inside the stator?
   - If not, continue with 8
   - If there is condensation, continue with 7
   - If there is gear oil, have the motor repaired by a specialist workshop
9. If there is moisture inside the stator:

   Clean the winding, dry it and check it electrically (see sec. "Preliminary work" (page 33)).
10. Replace anti-friction bearings [11], [44] with permitted anti-friction bearing types.

    See sec. "Permitted anti-friction bearing types" (page 79).

    Fill bearings about two thirds full with grease.

    See sec. "Bearing lubrication DR.315" (page 31)

    Important: Place sealing ring flanges [608] and [21] on the rotor shaft before mounting the bearings.
11. Assemble the motor by aligning it vertically, A-side up.
12. Insert cup springs [105] and lubricating ring [604] in the bearing bore of the flange [7].

    Suspend rotor [1] from the B-side thread and insert into the flange [7].

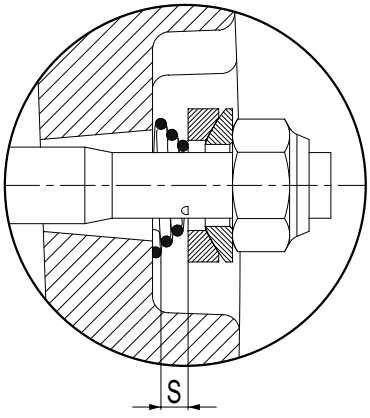
    Attach sealing ring flange [608] on the flange [7] using hex head screws [609].

13. Install stator [16].
    - Replace the stator seat sealing: Seal the sealing surface with duroplastic sealing compound (operating temperature -40...180 °C), such as "Hylomar L Spezial".

      Important: Protect winding overhang from damage!
    - Screw in the stator [16] and flange [7] with screws [15].
14. Before mounting the brake endshield [42], screw in the M8 setscrew approximately 200 mm (7.87 in) into the oil seal flange [21].
15. Mount the brake endshield [42], feed the setscrew in through a bore for the screw [25]. Screw in the brake endshield and stator [16] using machine screws [19] and hex nuts [17]. Lift the oil seal flange [21] with the setscrew, and fasten using 2 screws [25]. Remove the setscrew and screw in the remaining screws [25].
16. Renew oil seals
    - A-end: Insert the oil seals [106] and the oil seal [250] for gearmotors.

      Fill the space between the two oil seals approx. two-thirds full with grease (Klüber Petamo GHY133).
    - B-end: Insert the oil seal [30], and coat the sealing lip with the same grease. This applies to gearmotors only
17. Align cam of the friction disk and mount the brake to the brake endshield using screw [900].
18. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).

    This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



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Brake	Floating clearance s [mm]
BE120; BE122	2

19. Reinstall the fan [36] and fan guard [35].
20. Install the motor and accessories.

7.8.4 Setting the working air gap of BE120-BE122 brakes

⚠ DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

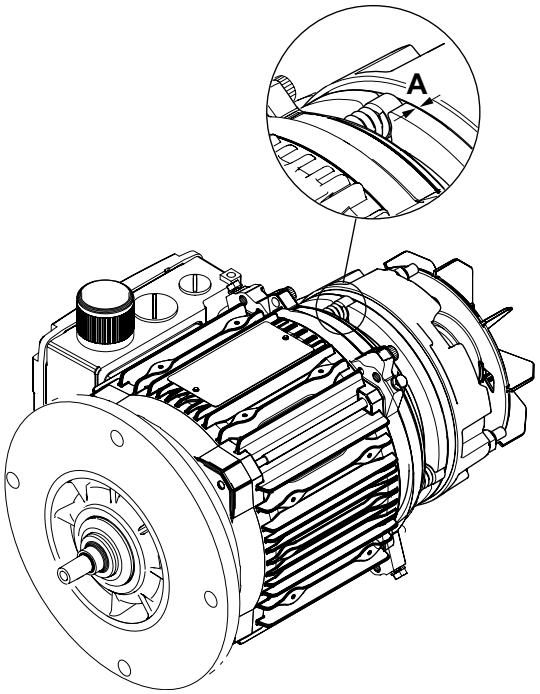
1. Remove forced cooling fan and incremental encoder, if installed

   See sec. "Preliminary work for motor and brake maintenance" (page 33)
2. Remove fan guard [35] and fan [36]
3. Push the rubber sealing collar [66] aside,
   – if necessary, release the clip
   – Vacuum up the abraded matter
4. Measure the brake disk [68, 68b]:

   If brake disk ≤ 12 mm, replace brake disk.

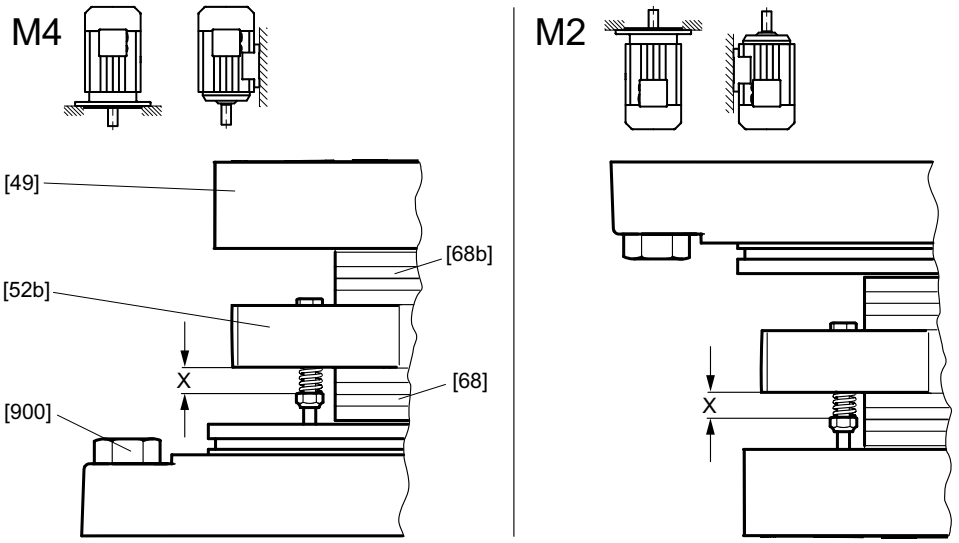
   See sec. "Replacing the brake disk of brakes BE120-BE122" (page 63)
5. Loosen the setting sleeve [67] by turning it towards the bearing endshield
6. Measure the working air gap A (see the following figure)

   (use a feeler gauge and measure at three points offset by 120°)



7. Tighten the hexagon nuts [61]
8. For BE 122 in vertical mounting position, set the 2 springs of the brake lining to the following value:

Mounting position	X in [mm]
M4	10.0
M2	10.5



[49] Pressure plate
[52b] Brake lining (only for BE122)
[68] Brake disc
[68b] Brake disk (only BE122)
[900] Hexagonal nut

9. Tighten the setting sleeves
   - Against the magnet
   - Until the working air gap is set correctly, see sec. "Technical Data" (page 68)
10. Install the rubber sealing collar back in place and re-install the dismantled parts.

7.8.5 Replacing the brake disk of BE120-BE122 brakes

When fitting a new brake disk (thickness ≤ 12 mm), inspect the other removed parts as well and install new ones if necessary.

⚠ DANGER!

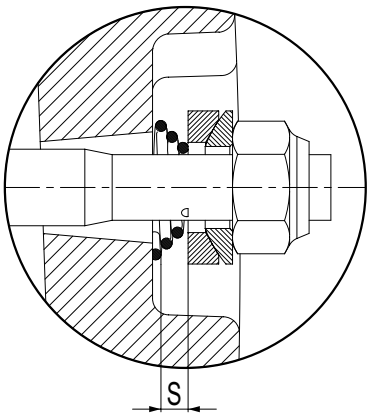
Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove forced cooling fan and incremental encoder, if installed

   See sec. "Preliminary work for motor and brake maintenance" (page 33)
2. Remove fan guard [35], circlip [32] and fan [36]
3. Loosen plug connector on the magnet
4. Remove the rubber sealing collar [66] and the manual brake release:
   – Setting nuts [58], ball cup [255], concave washer [256], conical coil springs [57], studs [56], release lever [53]
5. Loosen hex nuts [61], carefully pull off the magnet [54] and take out the brake springs [50/265].
6. Remove pressure plate [49] and brake disk [68b]. Clean brake components.
7. Install a new brake disk.
8. Re-install the brake components.
   – Except for the fan and the fan guard, because the working air gap has to be set first, see section "Setting the working air gap of the BE120-BE122 brakes" (page 61).

9. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



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Brake	Floating clearance s [mm]
BE120; BE122	2

10. Install the rubber sealing collar back in place and re-install the dismantled parts.

NOTES

- The lockable manual brake release (type HF) is already released if resistance is encountered when operating the grub screw.
- After replacing the brake disc, the maximum braking torque is reached only after several cycles.

7.8.6 Changing the braking torque of BE120-BE120 brakes

The braking torque can be changed in steps

- By the type and number of brake springs.
- By changing the brake

For the possible braking torque steps, please refer to sec. "Technical Data" (page 68).

Changing the brake spring

⚠ DANGER!

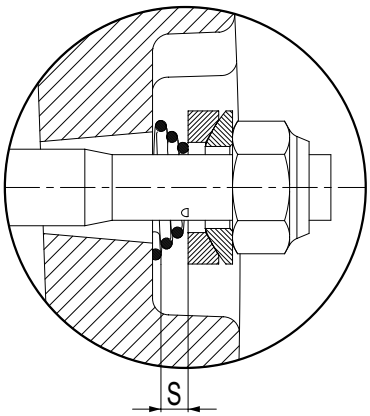
Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove forced cooling fan and incremental encoder, if installed

   See sec. "Preliminary work for motor and brake maintenance" (page 33)
2. Remove flange cover or fan guard [35], circlip [32] and fan [36]
3. Remove plug connector from the magnet [54] and protect against dirt
4. Remove the rubber sealing collar [66] and the manual brake release:
   – Setting nuts [58], ball cup [255], concave washer [256], conical coil springs [57], studs [56], release lever [53]
5. Loosen hex nuts [61], pull off the magnet [54]
   – By approx. 50 mm
6. Change or add brake springs [50/265]
   – Arrange brake springs symmetrically
7. Re-install the brake components
   – Except for the fan and the fan guard, because the working air gap has to be set first, see section "Setting the working air gap of the BE120-BE122 brakes" (page 61).

8. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



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Brake	Floating clearance s [mm]
BE120; BE122	2

9. Install the rubber sealing collar back in place and re-install the dismantled parts.

	NOTE
	Replace setting nuts [58] and hexagon nuts [61] if the removal procedure is repeated.

Changing the brake DR.315

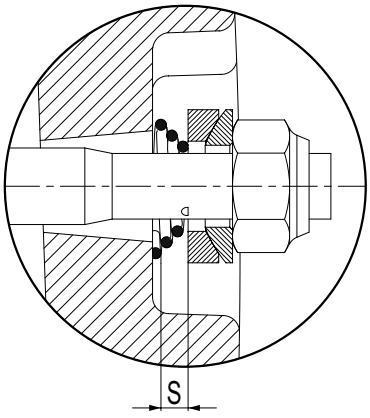
	STOP
	Make sure that the intended mounting position is permitted according to the data on the nameplate.

	⚠ DANGER!
	Risk of crushing if the drive starts up unintentionally. Severe or fatal injuries. • Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up! • Strictly observe the following instructions!

1. Remove forced cooling fan and incremental encoder, if installed

   See sec. "Preliminary work for motor and brake maintenance" (page 33)
2. Remove flange cover or fan guard [35], circlip [32] and fan [36]
3. Loosen brake connector
4. Loosen the bolts [900] and remove the brake from the brake endshield.
5. Align cam of the friction disk and mount the brake to the brake endshield using screw [900].
6. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



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Brake	Floating clearance s [mm]
BE120; BE122	2

8 Technical Data

8.1 Work done, working air gap, braking torques

Brake type	Work done until maintenance	Working air gap [mm]		Brake disc [mm]	Braking torque settings				
					Braking torque	Type and number of brake springs		Order number of brake springs	
	[10^6J]	min.[1]	max.	min.	[Nm]	Standard	Blue	Standard	Blue
BE05	120	0.25	0.6	9.0	5.0 3.5 2.5 1.8	2 2 - -	4 2 6 3	0135 017 X	1374 137 3
BE1	120	0.25	0.6	9.0	10 7.0 5.0	6 4 2	- 2 4	0135 017 X	1374 137 3
BE2	165	0.25	0.6	9.0	20 14 10 7.0	6 2 2 -	- 4 2 4	1374 024 5	1374 052 0
BE5	260	0.25	0.9	9.0	55 40 28 20	6 2 2 -	- 4 2 4	1374 070 9	1374 071 7
BE11	640	0.3	1.2	10.0	110 80 55 40	6 2 2 -	- 4 2 4	1374 183 7	1374 184 5
BE20	1000	0.3	1.2	12.0	200 150 110 80	6 4 3 3	- 2 3 -	1374 322 8	1374 248 5
BE120	520	0.4	1.2	12.0	1000 800 600 400	8 6 4 4	- 2 4 -	1360 877 0	1360 831 2
BE122	520	0.5	1.2	12.0	2000 1600 1200 800	8 6 4 4	- 2 4 -	1360 877 0	1360 831 2

1) When checking the working air gap, note: Parallelism tolerances on the brake disk may give rise to deviations of ± 0.15 mm after a test run.

8.2 Braking torque assignment

8.2.1 Motor size DR.71-DR.100

Motor type	Brake type	Braking torque steps in Nm										
DR.71	BE05	1.8	2.5	3.5	5.0							
	BE1				5.0	7.0	10					
DR.80	BE05	1.8	2.5	3.5	5.0							
	BE1				5.0	7.0	10					
	BE2					7.0	10	14	20			
DR.90	BE1				5.0	7.0	10					
	BE2					7.0	10	14	20			
	BE5								20	28	40	55
DR.100	BE2					7.0	10	14	20			
	BE5								20	28	40	55

8.2.2 Motor sizes DR.112-DR.160

Motor type	Brake type	Braking torque steps in Nm						
DR.112	BE5	28	40	55				
	BE11		40	55				
DR.132	BE5	28	40	55				
	BE11		40	55	80	110		
DR.160	BE11		40	55	80	110		
	BE20				80	110	150	200

8.2.3 Motor size DR.315

Motor type	Brake type	Braking torque steps in Nm						
DR.315	BE120	400	600	800	1000			
	BE122			800		1200	1600	2000

8.3 Operating currents

8.3.1 Brake BE05/1, BE2

The current values I_H (holding current) listed in the tables are r.m.s. values. Use only devices for measuring r.m.s. values. The inrush current (accelerator current) I_B only flows for a short time (approx. 160 ms) when the brake is released. There is no increased inrush current if the BG or BMS brake rectifiers are used or if there is a direct DC voltage supply - only possible with brakes up to size BE2.

	BE05/1	BE2
Max. braking torque [Nm]	5/10	20
Braking power [W]	32	43
Inrush current ratio I_B/I_H	4	4

Rated voltage V_R		BE05/1		BE2	
V_{AC}	V_{DC}	I_H [A_{AC}]	I_G [A_{DC}]	I_H [A_{AC}]	I_G [A_{DC}]
24 (23-26)	**10**	2,10	2.80	2.75	3.75
60 (57-63)	**24**	0.88	1.17	1.57	1.46
120 (111-123)	**48**	0.45	0.58	0.59	0.78
184 (174-193)	**80**	0.29	0.35	0.38	0.47
208 (194-217)	**90**	0.26	0.31	0.34	0.42
230 (218-243)	**96**	0.23	0.29	0.30	0.39
254 (244-273)	**110**	0.20	0.26	0.27	0.34
290 (274-306)	**125**	0.18	0.26	0.24	0.30
330 (307-343)	**140**	0.16	0.20	0.21	0.27
360 (344-379)	**160**	0.14	0.18	0.19	0.24
400 (380-431)	**180**	0.13	0.16	0.17	0.21
460 (432-484)	**200**	0.11	0.14	0.15	0.19
500 (485-542)	**220**	0.10	0.13	0.13	0.17
575 (543-600)	**250**	0.09	0.11	0.12	0.15

Key

I_B Accelerator current – brief inrush current
I_H Holding current r.m.s. value in the supply cable to the SEW brake rectifier
I_G Direct current with direct DC voltage supply
V_R Rated voltage (rated voltage range)

8.3.2 Brake BE5, BE11, BE20

The current values I_H (holding current) listed in the tables are r.m.s. values. Use only devices for measuring r.m.s. values. The inrush current (accelerator current) I_B only flows for a short time (approx. 160 ms) when the brake is released. There is no increased inrush current when brake rectifiers B and BMS are used. Direct voltage supply is not possible.

	BE5	BE11	BE20
Max. braking torque [Nm]	55	110	200
Braking power [W]	49	77	100
Inrush current ratio I_B/I_H	5,7	6.6	7

Rated voltage V_R		**BE5**	**BE11**	**BE20**
V_{AC}	**V_{DC}**	**I_H [A_{AC}]**	**I_H [A_{AC}]**	**I_H [A_{AC}]**
60 (57-63)	**24**	1.25	2.85	2.77
120 (111-123)	**48**	0.64	1.45	1.39
184 (174-193)	**80**	0.40	0.92	0.88
208 (194-217)	**90**	0.36	0.82	0.78
230 (218-243)	**96**	0.33	0.73	0.70
254 (244-273)	**110**	0.29	0.65	0.62
290 (274-306)	**125**	0.26	0.58	0.55
330 (307-343)	**140**	0.23	0.52	0.49
360 (344-379)	**160**	0.21	0.47	0.44
400 (380-431)	**180**	0.18	0.42	0.39
460 (432-484)	**200**	0.16	0.37	0.35
500 (485-542)	**220**	0.15	0.33	0.31
575 (543-600)	**250**	0.13	0.29	0.28

Key

I_B Accelerator current – brief inrush current
I_H Holding current r.m.s. value in the supply cable to the SEW brake rectifier
I_G Direct current with direct DC voltage supply
V_R Rated voltage (rated voltage range)

8.3.3 Brake BE120, BE122

The current values I_H (holding current) listed in the tables are r.m.s. values. Use only devices for measuring r.m.s. values. The inrush current (accelerator current) I_B only flows for a short time (approx. 400 ms) when the brake is released. Direct voltage supply is not possible.

	BE120	BE122
Max. braking torque [Nm]	1000	2000
Braking power [W]	250	250
Inrush current ratio I_B/I_H	4.9	4.9

Rated voltage V_R		BE120	BE122
V_{AC}	V_{DC}	I_H [A_{AC}]	I_H [A_{AC}]
230 (218-243)	**-**	1.80	1.80
254 (244-273)	**-**	1.60	1.60
290 (274-306)	**-**	1.43	1.43
360 (344-379)	**-**	1.14	1.14
400 (380-431)	**-**	1.02	1.02
460 (432-484)	**-**	0.91	0.91
500 (485-542)	**-**	0.81	0.81
575 (543-600)	**-**	0.72	0.72

Key

I_B Accelerator current – brief inrush current
I_H Holding current r.m.s. value in the supply cable to the SEW brake rectifier
I_G Direct current with direct DC voltage supply
V_R Rated voltage (rated voltage range)

8.4 Resistances

8.4.1 Brake BE05/1, BE2

	BE05/1	BE2
Max. braking torque [Nm]	5/10	20
Braking power [W]	32	43
Inrush current ratio I_B/I_H	4	4

Rated voltage V_R		BE05/1		BE2	
V_{AC}	V_{DC}	R_B	R_T	R_B	R_T
24 (23-26)	**10**	0.77	2.35	0.57	1.74
60 (57-63)	**24**	4.85	14.8	3.60	11.0
120 (111-123)	**48**	19.4	59.0	14.4	44.0
184 (174-193)	**80**	48.5	148	36.0	111
208 (194-217)	**90**	61.0	187	45.5	139
230 (218-243)	**96**	77.0	125	58.0	174
254 (244-273)	**110**	97.0	295	72.0	220
290 (274-306)	**125**	122	370	91	275
330 (307-343)	**140**	154	470	115	350
360 (344-379)	**160**	194	590	144	440
400 (380-431)	**180**	245	740	182	550
460 (432-484)	**200**	310	940	230	690
500 (485-542)	**220**	385	1180	290	870
575 (543-600)	**250**	490	1480	365	1100

8.4.2 Brake BE5, BE11, BE20

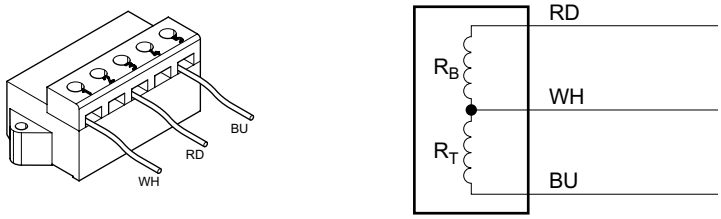
	BE5	BE11	BE20
Max. braking torque [Nm]	55	110	200
Braking power [W]	49	77	100
Inrush current ratio I_B/I_H	5.7	6.6	7

Rated voltage V_R		BE5		BE11		BE20	
V_{AC}	V_{DC}	R_B	R_T	R_B	R_T	R_B	R_T
60 (57-63)	**24**	2.20	10.5	1.20	7.6	0.8	5.0
120 (111-123)	**48**	8.70	42.0	4.75	30.5	3.4	20.0
184 (174-193)	**80**	22.0	105	12.0	76.0	8.5	50.4
208 (194-217)	**90**	27.5	132	15.1	96	10.6	63.5
230 (218-243)	**96**	34.5	166	19.0	121	13.4	79.9
254 (244-273)	**110**	43.5	210	24.0	152	16.9	100.6
290 (274-306)	**125**	55.0	265	30.0	191	21.2	126,6
330 (307-343)	**140**	69.0	330	38.0	240	26.7	159.4
360 (344-379)	**160**	87.0	420	47.5	305	33.7	200.7
400 (380-431)	**180**	110	530	60	380	42.4	252.7
460 (432-484)	**200**	138	660	76	480	53.3	318.1
500 (485-542)	**220**	174	830	95	600	67.2	400.4
575 (543-600)	**250**	220	1050	120	760	84.5	504.1

8.4.3 Resistance measurement BE05-BE20

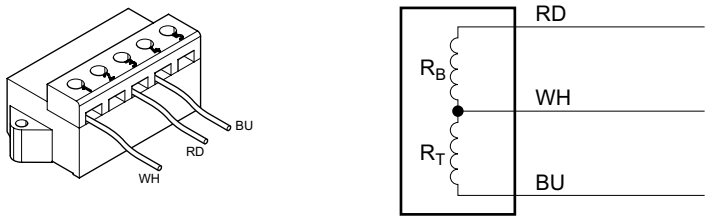
Cut-off in the AC circuit

The following figure shows the resistance measurement for a cut-off in the AC circuit.



Cut-off in the DC and AC circuits

The following figure shows the resistance measurement for a cut-off in the AC and DC circuits.



BS Accelerator coil
TS Coil section
R_B Accelerator coil resistance at 20 °C [Ω]
R_T Coil section resistance at 20 °C [Ω]
V_R Rated voltage (rated voltage range)

RD red
WH white
BU blue

	NOTE
	For measuring the resistance of the RT coil section or the RB accelerator coil, remove the white conductor from the brake rectifier. If it remains connected, the internal resistance of the brake rectifier will cause erroneous results.

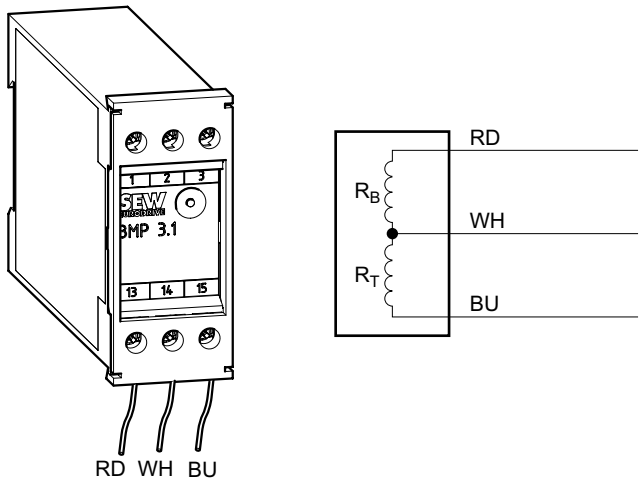
8.4.4 Brake BE120, BE122

	BE120	BE122
Max. braking torque [Nm]	1000	2000
Braking power [W]	250	250
Inrush current ratio I_B/I_H	4.9	4.9

Rated voltage V_R		BE120		BE122	
V_{AC}	V_{DC}	R_B	R_T	R_B	R_T
230 (218-243)	-	7.6	29.5	7.6	29.5
254 (244-273)	-	9.5	37.0	9.5	37.0
290 (274-306)	-	12.0	46.5	12.0	46.5
360 (344-379)	-	19.1	74.0	19.1	74.0
400 (380-431)	-	24.0	93.0	24.0	93.0
460 (432-484)	-	30.0	117.0	30.0	117.0
500 (485-542)	-	38.0	147.0	38.0	147.0
575 (543-600)	-	48.0	185.0	48.0	185.0

Resistance measurement BE120, BE122

The following figure shows the resistance measurement for BMP 3.1.



BS Accelerator coil
TS Coil section
R_B Accelerator coil resistance at 20 °C [Ω]
R_T Coil section resistance at 20 °C [Ω]
V_R Rated voltage (rated voltage range)

	NOTE
	For measuring the resistance of the RT coil section or the RB accelerator coil, remove the white conductor from the brake rectifier. If it remains connected, the internal resistance of the brake rectifier will cause erroneous results.

8.5 Brake rectifier combinations

8.5.1 Brake BE05/1, BE2, BE5, BE11, BE20

The following table shows the standard and optional combinations of brakes and brake rectifiers.

		BE05	BE1	BE2	BE5	BE11	BE20
Size	Size 1.5	X[1]	X[1]	X[1]	–	–	–
	Size 3	X[2]	X[2]	X[2]	–	–	–
BGE	BGE 1.5	•	•	•	X[1]	X[1]	X[1]
	BGE 3	•	•	•	X[2]	X[2]	X[2]
BS	BS 24	X	X	X	–	–	–
BMS	BMS 1.5	•	•	•	–	–	–
	BMS 3	•	•	•	–	–	–
BME	BME 1.5	•	•	•	•	•	•
	BME 3	•	•	•	•	•	•
BMH	BMH 1.5	•	•	•	•	•	•
	BMH 3	•	•	•	•	•	•
BMK	BMK 1.5	•	•	•	•	•	•
	BMK 3	•	•	•	•	•	•
BMP	BMP 1.5	•	•	•	•	•	•
	BMP 3	•	•	•	•	•	•
BMV	BMV 5	•	•	•	•	•	•
BSG	BSG	•	•	•	X	X	X
BSR	BGE 3 + SR 11	•	•	•	•	•	–
	BGE 3 + SR 15	•	•	•	•	•	•
	BGE 1.5 + SR 11	•	•	•	•	•	–
	BGE 1.5 + SR 15	•	•	•	•	•	•
BUR	BGE 3 + UR 11	•	•	•	•	–	–
	BGE 1.5 + UR 15	•	•	•	•	•	•

X Standard design
X[1] Standard design with brake rated voltage of AC 150 - 500 V
X[2] Standard design with brake rated voltage of AC 24/42 - 150 V
• Optional
– Not permitted

8.5.2 Brake BE120, BE122

The following table shows the standard and optional combinations of brakes and brake rectifiers.

	BE120	BE122
BMP 3.1	X	X

8.6 Brake control

8.6.1 Wiring space of the motor

The following table lists the technical data of brake control systems for installation in the motor wiring space and the assignments with regard to motor size and connection technology. The different housings have different colors (= color code) to make them easier to distinguish.

Motor size DR.71-DR.160

Type	Function	Voltage	Holding current I_{Hmax} [A]	Type	Part number	Color code
Size	One-way rectifier	AC 150...500 V	1.5	Size 1.5	825 384 6	black
		AC 24...500 V	3.0	Size 3	825 386 2	brown
BGE	One-way rectifier with electronic switching	AC 150..0.500 V	1.5	BGE 1.5	825 385 4	red
		AC 42..0.150 V	3.0	BGE 3	825 387 0	blue
BSR	One-way rectifier + current relay for cut-off in the DC circuit	AC 150...500 V	1.0	BGE 1.5 + SR 11	825 385 4 826 761 8	
			1.0	BGE 1.5 + SR 15	825 385 4 826 762 6	
		AC 42..0.150 V	1.0	BGE 3 + SR11	825 387 0 826 761 8	
			1.0	BGE 3 + SR15	825 387 0 826 762 6	
BUR	One-way rectifier + voltage relay for cut-off in the DC circuit	AC 150...500 V	1.0	BGE 1.5 + UR 15	825 385 4 826 759 6	
		AC 42..0.150 V	1.0	BGE 3 + UR 11	825 387 0 826 758 8	
BS	Varistor protection circuit	DC 24 V	5.0	BS24	826 763 4	Aqua
BSG	Electronic switching	DC 24 V	5.0	BSG	825 459 1	white

Motor size DR.315

Type	Function	Voltage	Holding current I_{Hmax} [A]	Type	Part number	Color code
BMP	One-way rectifier with electronic switching, integrated voltage relay for cut-off in the DC circuit.	AC 230..0.575 V	2.8	BMP 3.1	829 507 7	

8.6.2 Control cabinet

The following tables list the technical data of brake control systems for installation in the control cabinet and the assignments with regard to motor size and connection technology. The different housings have different colors (= color code) to make them easier to distinguish.

Motor size DR.71-DR.160

Type	Function	Voltage	Holding current I_{Hmax} [A]	Type	Part number	Color code
BMS	One-way rectifier such as BG	AC 150...500 V	1.5	BMS 1.5	825 802 3	black
		AC 42...150 V	3.0	BMS 3	825 803 1	brown
BME	One-way rectifier with electronic switching such as BGE	AC 150..0.500 V	1.5	BME 1.5	825 722 1	red
		AC 42...150 V	3.0	BME 3	825,723 X	blue
BMH	One-way rectifier with electronic switching and heating function	AC 150..0.500 V	1.5	BMH 1.5	825,818 X	Green
		AC 42...150 V	3	BMH 3	825 819 8	yellow
BMP	One-way rectifier with electronic switching, integrated voltage relay for cut-off in the DC circuit	AC 150..0.500 V	1.5	BMP 1.5	825 685 3	white
		AC 42...150 V	3.0	BMP 3	826 566 6	Light blue
BMK	One-way rectifier with electronic switch mode, 24 V_{DC} control input and separation in the DC circuit	AC 150..0.500 V	1.5	BMK 1.5	826 463 5	Aqua
		AC 42...150 V	3.0	BMK 3	826 567 4	Bright red
BMV	Brake control unit with electronic switching, 24-V_{DC} control input and fast cut-off	DC 24 V	5.0	BMV 5	1 300 006 3	white

Motor size DR.315

Type	Function	Voltage	Holding current I_{Hmax} [A]	Type	Part number	Color code
BMP	One-way rectifier with electronic switching, integrated voltage relay for cut-off in the DC circuit.	AC 230..0.575 V	2.8	BMP 3.1	829 507 7	

8.7 Permitted roller bearing types

8.7.1 Anti-friction bearing types for motor sizes DR.71-DR.160

Motor type	Drive-end bearing		Non drive-end bearing	
	IEC motor	Gearmotor	AC motor	Brakemotor
DR.71	6204-2Z-J-C3	6303-2Z-J-C3	6203-2Z-J-C3	6203-2RS-J-C3
DR.80	6205-2Z-J-C3	6304-2Z-J-C3	6304-2Z-J-C3	6304-2RS-J-C3
DR.90-DR.100	6306-2Z-J-C3		6205-2Z-J-C3	6205-2RS-J-C3
DR.112-DR.132	6308-2Z-J-C3		6207-2Z-J-C3	6207-2RS-J-C3
DR.160	6309-2Z-J-C3		6209-2Z-J-C3	6209-2RS-J-C3

8.7.2 Anti-friction bearing types for motor size DR.315

Motor type	Drive-end bearing		Non drive-end bearing	
	IEC motor	Gearmotor	IEC motor	Gearmotor
DR.315K	6319-J-C3	6319-J-C3	6319-J-C3	6319-J-C3
DR.315S				
DR.315M		6322-J-C3		6322-J-C3
DR.315L				

Motor with reinforced bearing

Motor type	Drive-end bearing	Non drive-end bearing	
		IEC motor	Gearmotor
DR.315K	NU319E	6319-J-C3	6319-J-C3
DR.315S			
DR.315M			6322-J-C3
DR.315L			

8.8 Lubricant tables

8.8.1 Lubricant table for roller bearings

Motor size DR.71-DR.160

The bearings are 2Z or 2RS closed bearings and cannot be regreased.

	Ambient temperature	Manufacturer	Type	DIN designation
Motor anti-friction bearings	-20 °C ... 80 °C	Esso	Polyrex EM[1)]	K2P-20
	+20 °C ... 100 °C	Klüber	Barrierta L55/2[2)]	KX2U
	-40 °C ... 60 °C	Kyodo Yushi	Multemp SRL[2)]	K2N-40

1) Mineral lubricant (= mineral-based anti-friction bearing grease)

2) Synthetic lubricant (= synthetic-based anti-friction bearing grease)

Motor size DR.315

Motors of size DR.315 can be equipped with a relubrication device.

	Ambient temperature	Manufacturer	Type	DIN designation
Motor anti-friction bearings	-20 °C ... 80 °C	Esso	Polyrex EM[1)]	K2P-20
	-40 °C ... 60 °C	SKF	GXN[1)]	K2N-40

1) Mineral lubricant (= mineral-based anti-friction bearing grease)

8.9 Order data for lubricants and anti-corrosion agents

The lubricants and anti-corrosion agents can be ordered directly from SEW-EURODRIVE with the following order number.

Usage	Manufacturer	Type	quantity	Order number
Lubricant for anti-friction bearings	Esso	Polyrex EM	400 g	09101470
	SKF	GXN	400 g	09101276
Lubricant for Sealing rings	Klüber	Petamo GHY 133	10 g	04963458
Anti-corrosion agents and lubricants	SEW-EURODRIVE	Noco® Fluid	5.5 g	09107819

9 Appendix

9.1 Wiring diagrams

	NOTE
	Connect the motor as shown in the wiring diagram or the assignment diagram included with the motor. The following section only gives an overview of the most common connection options. You can obtain the valid wiring diagrams free of charge from SEW-EURODRIVE.

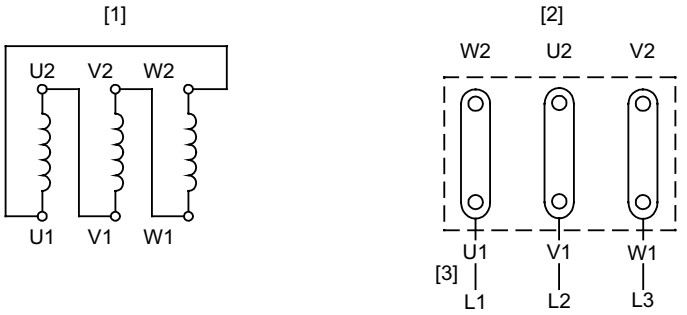
9.1.1 Delta and star connection

AC motor

For all motors with one speed, direct on-line or ⅄- △ startup.

△ *connection*

The following figure depicts the △ connection for low voltage.

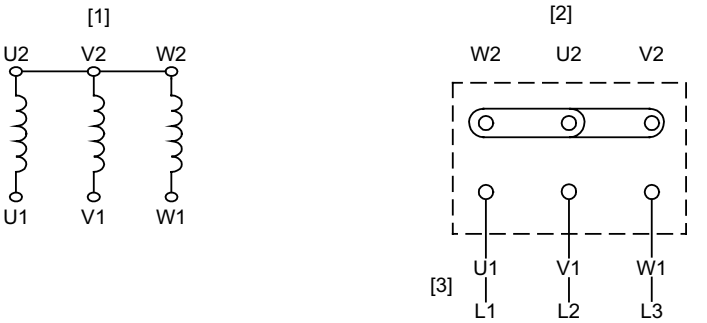


242603147

[1] Motor winding
[2] Motor terminal board
[3] Incoming cables

⅄ *connection*

The following figure depicts the ⅄ connection for high voltage.



242598155

[1] Motor winding
[2] Motor terminal board
[3] Incoming cables

Change in direction of rotation: Replacing two incoming cables (L1 - L2).

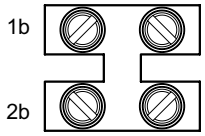
9.1.2 Motor protection using TF or TH with DR71-100

TF/TH

The following figures show the connection of the motor protection with TF PTC thermistor sensors or TH bimetallic thermostats.

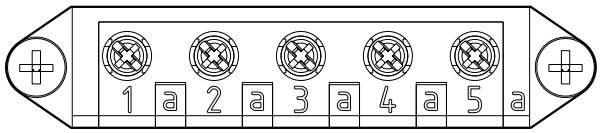
Either a two-pole terminal clip or a five-pole terminal strip is available for connecting to the trip switch.

Example: TF/TH to a two-pole terminal strip



1b	2b
TF/TH	TF/TH

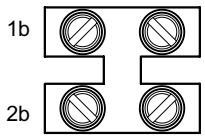
Example: 2 x TF/TH to a five-pole terminal strip



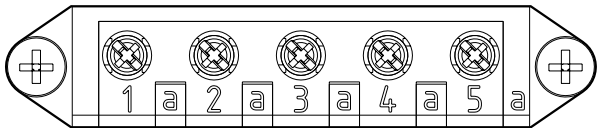
1a	2a	3a	4a	5a
1.TF/TH	1.TF/TH	2.TF/TH	2.TF/TH	-

2 x TF / TH / with anti-condensation heater

The following figure shows the connection of the motor protection with 2 TF PTC thermistor sensors or TH bimetal thermostats and Hx anti-condensation heater.



1b	2b
Hx	Hx



1a	2a	3a	4a	5a
1.TF/TH	1.TF/TH	2.TF/TH	2.TF/TH	-

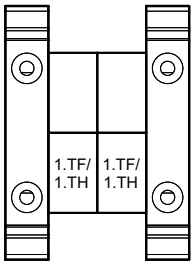
9.1.3 Motor protection using TF or TH with DR315

TF/TH

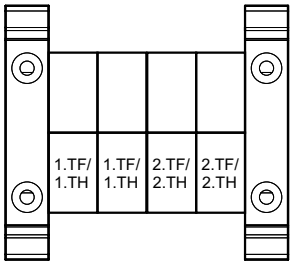
The following figures show the connection of the motor protection with TF PTC thermistor sensors or TH bimetallic thermostats.

Depending on the design an x-pole terminal clip is available for connecting to the trip switch.

Example: TF/TH to terminal strip



Example: 2 x TF/TH to terminal strip



9.1.4 Brake control BGE; BG; BSG; BUR

Brake BE

Brake control BGE; BG; BSG; BUR;

Apply voltage to release the brake (see nameplate).

Contact rating of the brake contactors: AC3 according to EN 60947-4-1

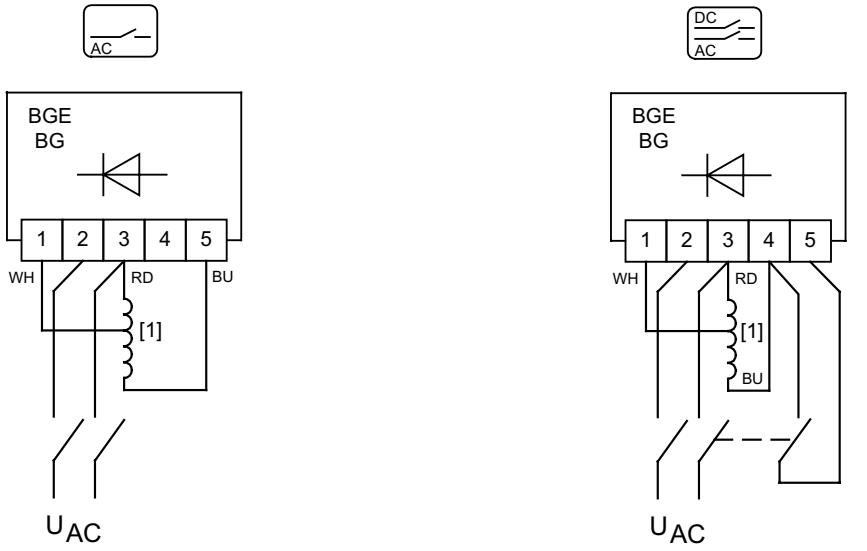
The voltage can be distributed as follows:

- Through a separate supply cable
- From the motor terminal board

This does not apply to multi-speed and frequency-controlled motors.

BG / BGE

The following figure shows the wiring for BG and BGE brake rectifiers for the AC-side cut-off as well as the DC and AC-side cut-off.

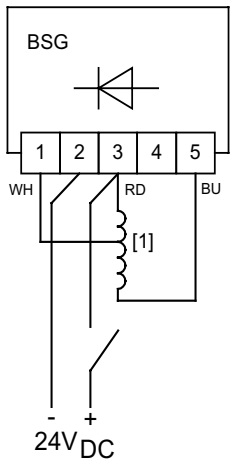


242604811

[1] Brake coil

BSG

The following figure shows the DC 24 V connection of the BSG control unit



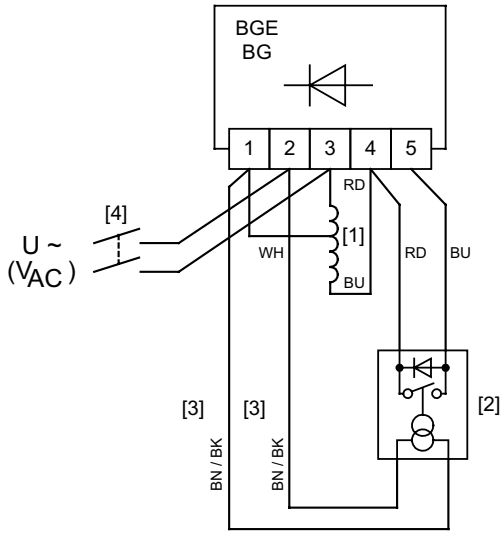
242606475

[1] Brake coil

BUR

STOP	**STOP**
	Connection to motor terminal board not permitted.

The following figure shows the wiring for the BUR brake control



242608139

[1] Brake coil
[2] Voltage relay UR11/UR15
UR 11 (42-150 V) = BN
UR 15 (150-500 V) = BK

9.1.5 BSR brake control

Brake BE

BSR brake control system

Brake voltage = Phase voltage

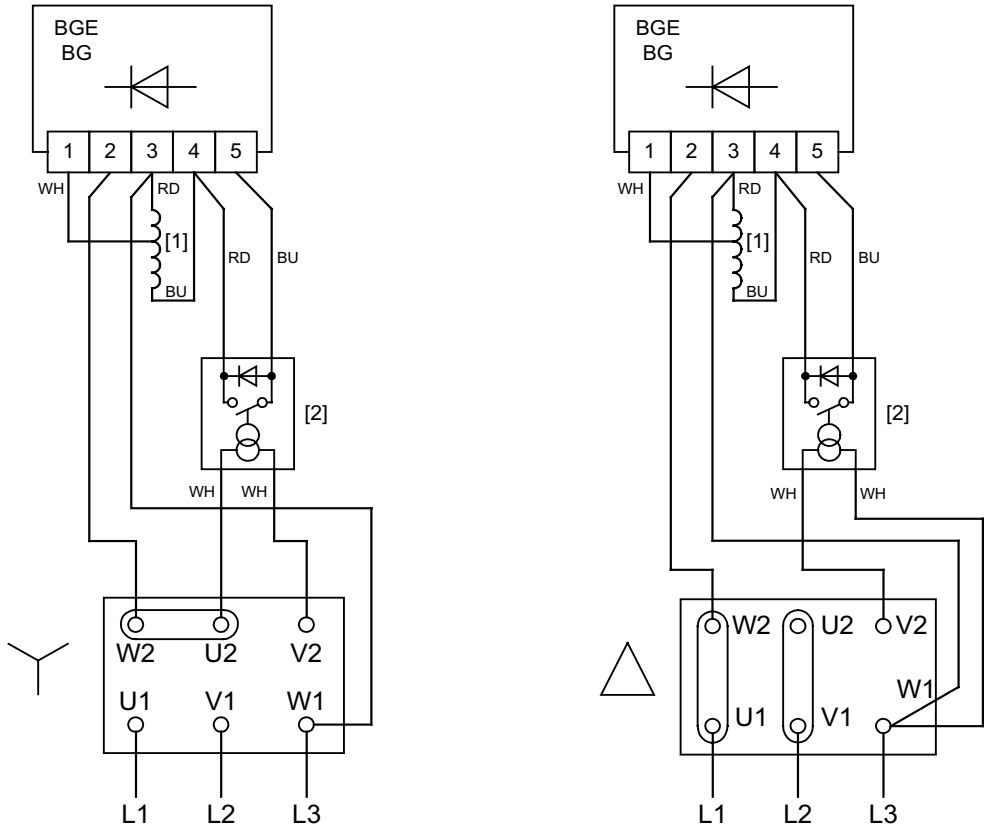
The white connecting leads are the ends of a converter loop and, depending on the motor connection, must be connected to the motor terminal block instead of the △ or 人 bridge.

Factory wiring 人

The following figure shows the factory wiring for the BSR brake control

Example: Motor: AC 230 V / AC 400 V

Brake: AC 230 V



242599819

[1] Brake coil
[2] SR11/15 current relay

9.1.6 BMP3.1 brake control in the terminal box

Brake BE120; BE122

BMP3.1 brake control

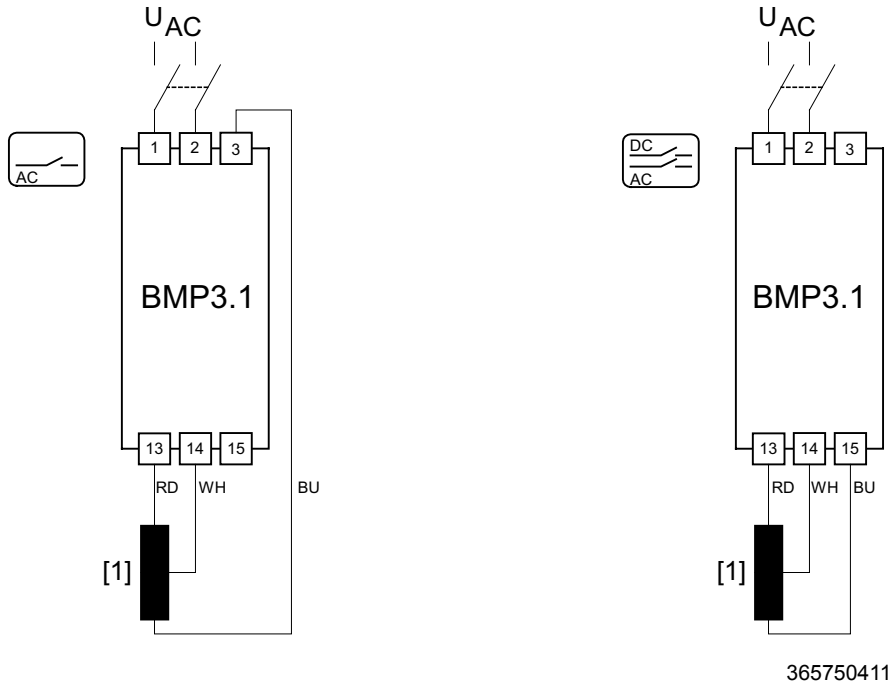
Apply voltage to release the brake (see nameplate).

Contact rating of the brake contactors: AC3 according to EN 60947-4-1

Separate supply cables are required for the voltage supply.

BMP3.1

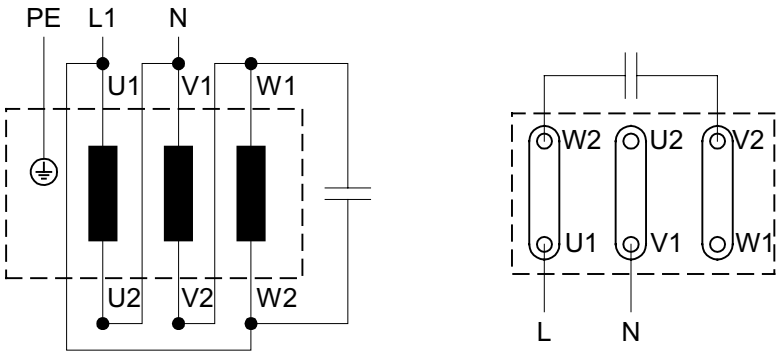
The following figure shows the wiring for the BMP3.1 brake rectifier for the AC-side cut-off as well as the DC and AC-side cut-off.



[1] Brake coil

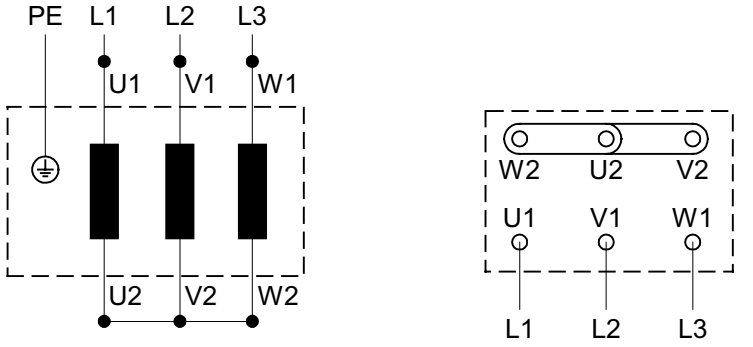
9.1.7 V forced cooling fan

△ - *Steinmetz* The following figure shows the wiring of the V forced cooling fan for delta-Steinmetz connection.



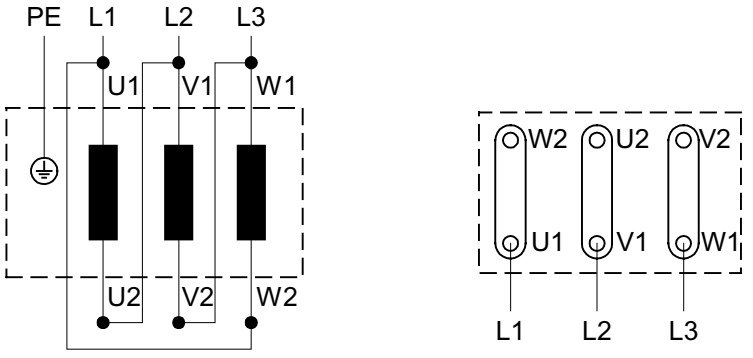
523348491

⅄ *connection* The following figure shows the wiring of the V forced cooling fan for ⅄ connection.



523350155

△*connection* The following figure shows the wiring of the V forced cooling fan for △ connection.



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10 Malfunctions

10.1 Motor malfunctions

Malfunction	Possible cause	Remedy
Motor does not start up	Interruption in supply cable	Check the connections and (intermediate) terminal points, correct if necessary
	Brake does not release	See Sec. "Brake faults" (page 91)
	Supply cable fuse has blown	Replace fuse
	Motor protection (switch) has triggered	Check that the motor protection (switch) is set correctly; current specification is on the nameplate
	Motor contactor does not trip	Check motor contactor control
	Malfunction in control or in the control process	Observe the switching sequence; correct if necessary
Motor does not start or only with difficulty	Motor power designed for delta connection but used in star connection	Correct the connection from star to delta; follow the wiring diagram
	Motor power designed for star-star connection but only connected in star	Correct the connection from star to star-star; follow the wiring diagram
	Voltage or frequency deviate considerably from setpoint, at least while being switched on.	Provide better power supply system; reduce the power supply load; Check cross section of supply cable, replace with cable of larger cross section if needed
Motor does not start in star connection, only in delta connection	Torque not sufficient in start connection	If the delta inrush current is not too high (observe the regulations of the power supplier), start up directly in delta; Check the project planning and use a larger motor or special version if necessary (consult with SEW-EURODRIVE)
	Contact fault on star/delta switch	Check the switch, replace if necessary; Check the connections
Incorrect direction of rotation	Motor connected incorrectly	Swap two phases of the motor supply cable
Motor hums and has high current consumption	Brake does not release	See Sec. "Brake faults" (page 91)
	Winding defective	Send motor to specialist workshop for repair
	Rotor rubbing	
Fuses blow or motor protection trips immediately	Short circuit in the motor supply cable	Rectify short circuit
	Supply cables connected incorrectly	Correct the wiring, observe the wiring diagram
	Short circuit in motor	Send motor to specialist workshop for repair
	Ground fault on motor	
Severe speed loss under load	Motor overload	Measure power, check project planning and use larger motor or reduce load if necessary
	Voltage drops	Check cross section of supply cable, replace with cable of larger cross section if needed
Motor heats up excessively (measure temperature)	Overload	Measure power, check project planning and use larger motor or reduce load if necessary
	Insufficient cooling	Provide for cooling air supply or clear cooling air passages, retrofit forced cooling fan if necessary. Check the air filter, clean or replace if necessary
	Ambient temperature is too high	Observe the permitted temperature range, reduce the load if necessary
	Motor in delta connection instead of star connection as provided for	Correct the wiring, observe the wiring diagram
	Loose contact in supply cable (one phase missing)	Tighten loose contact, check connections, observe wiring diagram
	Fuse has blown	Look for and rectify cause (see above); replace fuse
	Mains voltage deviates from the rated motor voltage by more than 5 % (range A) / 10% (range B).	Adjust motor to mains voltage.
	Rated operation type (S1 to S10, DIN 57530) exceeded, e.g. through excessive starting frequency	Adjust rated operation type of motor to required operating conditions; if necessary call in a specialist to determine correct drive

Malfunction	Possible cause	Remedy
Excessively loud	Ball bearing compressed, contaminated or damaged	Re-align motor and the driven machine, inspect anti-friction bearing and replace if necessary. See sec. "Permitted anti-friction bearing types" (page 79).
	Vibration of rotating parts	Look for the case, possibly an imbalance; correct the cause, observe method for balancing
	Foreign bodies in cooling air passages	Clean cooling air passages

10.2 Brake malfunctions

Malfunction	Possible cause	Remedy
Brake does not release	Incorrect voltage on brake control unit	Apply the correct voltage; brake voltage specified on the nameplate
	Brake control unit failed	Install a new brake control, check resistances and insulation of the brake coils (see "Resistances" section for resistance values). Check switchgear, replace if needed
	Max. permitted working air gap exceeded because brake lining worn down.	Measure and set working air gap. See the following section: • "Setting the working air gap of brakes BE05-BE20" (page 45) "Setting the working air gap of brakes BE120-BE122" (page 61) If the brake disk is too thin, replace the brake disk. See the following section: • "Replacing the brake disk of brakes BE05-BE20" (page 46) • "Replacing the brake disk of brakes BE120-BE122" (page 63)
	Voltage drop on supply cable > 10%	Provide correct connection voltage: brake voltage specifications on the nameplate. Check the cross section of the brake supply cable, increase cross section if necessary
	Inadequate cooling, brake overheats	Provide for cooling air supply or clear cooling air passages, check air filter, clean or replace if necessary. Replace type BG brake rectifier with type BGE
	Brake coil has interturn fault or short circuit to exposed conductive part	Check resistances and insulation of the brake coils (see "Resistances" section for resistance values); Replace complete brake and brake control system (specialist workshop), Check switchgear, replace if needed
	Rectifier defective	Replace rectifier and brake coil; it may be more economical to replace the complete brake

Malfunction	Possible cause	Remedy
Brake does not brake	Working air gap not correct	Measure and set working air gap. See the following section: • "Setting the working air gap of brakes BE05-BE20" (page 45) • "Setting the working air gap of brakes BE120-BE122" (page 61) If the brake disk is too thin, replace the brake disk. See the following section: • "Replacing the brake disk of brakes BE05-BE20" (page 46) • "Replacing the brake disk of brakes BE120-BE122" (page 63)
	Brake lining worn down.	Replace entire brake disc. See the following section: • "Replacing the brake disk of brakes BE05-BE20" (page 46) • "Replacing the brake disk of brakes BE120-BE122" (page 63)
	Incorrect braking torque.	Check the project planning and change the braking torque if needed; see sec. "Work done, working air gap, braking torques" (page 68) • by changing the type and number of brake springs. See the following section: – "Changing the braking torque of brakes BE05-BE20" (page 48) – "Changing the braking torque of brakes BE120-BE122" (page 65) • By selecting a different brake See section "Braking torque assignment" (page 69)
	Working air gap so large that setting nuts of the manual brake release come into contact.	Set the working air gap. See the following section: • "Setting the working air gap of brakes BE05-BE20" (page 45) • "Setting the working air gap of brakes BE120-BE122" (page 61)
	Manual brake release device not set correctly	Set the setting nuts for the manual brake release correctly See the following section: • "Changing the braking torque of brakes BE05-BE20" (page 48) • "Changing the braking torque of brakes BE120-BE122" (page 65)
	Brake locked by manual brake release HF	Loosen the setscrew, remove if needed
Brake is applied with time lag	Brake is switched on AC voltage side only	Switch both the DC and AC sides (e.g. through retrofitting the current relay from SR to BSR or the voltage relay from UR to BUR); observe wiring diagram
Noises in vicinity of brake	Gearing wear on the brake disk or the carrier caused by jolting startup	Check the project planning, replace the brake disk if needed See the following section: • "Replacing the brake disk of brakes BE05-BE20" (page 46) • "Replacing the brake disk of brakes BE120-BE122" (page 63) Have a specialist workshop replace the carrier
	Pulsating torques due to incorrectly set frequency inverter	Check / correct setting of frequency inverter according to operating instructions.

10.3 Malfunctions when operated with a frequency inverter

The symptoms described in the "Motor Problems" section may also occur when the motor is operated with a frequency inverter. Please refer to the frequency inverter operating instructions for the meaning of the problems that occur and to find information about rectifying the problems.

10.4 Customer service

Please have the following information to hand if you require the assistance of our customer service:

- Nameplate data (complete)
- Type and extent of the problem
- Time the problem occurred and any accompanying circumstances
- Assumed cause

11 Address List

Germany			
Headquarters **Production** **Sales**	**Bruchsal**	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 D-76646 Bruchsal P.O. Box Postfach 3023 • D-76642 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-1970 http://www.sew-eurodrive.de sew@sew-eurodrive.de
Service Competence Center	**Central**	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 1 D-76676 Graben-Neudorf	Tel. +49 7251 75-1710 Fax +49 7251 75-1711 sc-mitte@sew-eurodrive.de
	North	SEW-EURODRIVE GmbH & Co KG Alte Ricklinger Straße 40-42 D-30823 Garbsen (near Hannover)	Tel. +49 5137 8798-30 Fax +49 5137 8798-55 sc-nord@sew-eurodrive.de
	East	SEW-EURODRIVE GmbH & Co KG Dänkritzer Weg 1 D-08393 Meerane (near Zwickau)	Tel. +49 3764 7606-0 Fax +49 3764 7606-30 sc-ost@sew-eurodrive.de
	South	SEW-EURODRIVE GmbH & Co KG Domagkstraße 5 D-85551 Kirchheim (near München)	Tel. +49 89 909552-10 Fax +49 89 909552-50 sc-sued@sew-eurodrive.de
	West	SEW-EURODRIVE GmbH & Co KG Siemensstraße 1 D-40764 Langenfeld (near Düsseldorf)	Tel. +49 2173 8507-30 Fax +49 2173 8507-55 sc-west@sew-eurodrive.de
	Electronics	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 D-76646 Bruchsal	Tel. +49 7251 75-1780 Fax +49 7251 75-1769 sc-elektronik@sew-eurodrive.de
	Drive Service Hotline / 24 Hour Service		+49 180 5 SEWHELP +49 180 5 7394357
	Additional addresses for service in Germany provided on request!		

France			
Production **Sales** **Service**	**Haguenau**	SEW-USOCOME 48-54, route de Soufflenheim B. P. 20185 F-67506 Haguenau Cedex	Tel. +33 3 88 73 67 00 Fax +33 3 88 73 66 00 http://www.usocome.com sew@usocome.com
Production	**Forbach**	SEW-EUROCOME Zone Industrielle Technopôle Forbach Sud B. P. 30269 F-57604 Forbach Cedex	Tel. +33 3 87 29 38 00
Assembly **Sales** **Service**	**Bordeaux**	SEW-USOCOME Parc d'activités de Magellan 62, avenue de Magellan - B. P. 182 F-33607 Pessac Cedex	Tel. +33 5 57 26 39 00 Fax +33 5 57 26 39 09
	Lyon	SEW-USOCOME Parc d'Affaires Roosevelt Rue Jacques Tati F-69120 Vaulx en Velin	Tel. +33 4 72 15 37 00 Fax +33 4 72 15 37 15
	Paris	SEW-USOCOME Zone industrielle 2, rue Denis Papin F-77390 Verneuil l'Etang	Tel. +33 1 64 42 40 80 Fax +33 1 64 42 40 88
	Additional addresses for service in France provided on request!		

Algeria			
Sales	**Alger**	Réducom 16, rue des Frères Zaghnoun Bellevue El-Harrach 16200 Alger	Tel. +213 21 8222-84 Fax +213 21 8222-84

Argentina			
Assembly **Sales** **Service**	**Buenos Aires**	SEW EURODRIVE ARGENTINA S.A. Centro Industrial Garin, Lote 35 Ruta Panamericana Km 37,5 1619 Garin	Tel. +54 3327 4572-84 Fax +54 3327 4572-21 sewar@sew-eurodrive.com.ar

Australia			
Assembly **Sales** **Service**	**Melbourne**	SEW-EURODRIVE PTY. LTD. 27 Beverage Drive Tullamarine, Victoria 3043	Tel. +61 3 9933-1000 Fax +61 3 9933-1003 http://www.sew-eurodrive.com.au enquires@sew-eurodrive.com.au
	Sydney	SEW-EURODRIVE PTY. LTD. 9, Sleigh Place, Wetherill Park New South Wales, 2164	Tel. +61 2 9725-9900 Fax +61 2 9725-9905 enquires@sew-eurodrive.com.au
	Townsville	SEW-EURODRIVE PTY. LTD. 12 Leyland Street Garbutt, QLD 4814	Tel. +61 7 4779 4333 Fax +61 7 4779 5333 enquires@sew-eurodrive.com.au

Austria			
Assembly **Sales** **Service**	**Wien**	SEW-EURODRIVE Ges.m.b.H. Richard-Strauss-Strasse 24 A-1230 Wien	Tel. +43 1 617 55 00-0 Fax +43 1 617 55 00-30 http://sew-eurodrive.at sew@sew-eurodrive.at

Belarus			
Sales	**Minsk**	SEW-EURODRIVE BY RybalkoStr. 26 BY-220033 Minsk	Tel.+375 (17) 298 38 50 Fax +375 (17) 29838 50 sales@sew.by

Belgium			
Assembly **Sales** **Service**	**Brüssel**	SEW Caron-Vector S.A. Avenue Eiffel 5 B-1300 Wavre	Tel. +32 10 231-311 Fax +32 10 231-336 http://www.sew-eurodrive.be info@caron-vector.be

Brazil			
Production **Sales** **Service**	**Sao Paulo**	SEW-EURODRIVE Brasil Ltda. Avenida Amâncio Gaiolli, 50 Caixa Postal: 201-07111-970 Guarulhos/SP - Cep.: 07251-250	Tel. +55 11 6489-9133 Fax +55 11 6480-3328 http://www.sew.com.br sew@sew.com.br
	Additional addresses for service in Brazil provided on request!		

Bulgaria			
Sales	**Sofia**	BEVER-DRIVE GmbH Bogdanovetz Str.1 BG-1606 Sofia	Tel. +359 2 9151160 Fax +359 2 9151166 bever@fastbg.net

Cameroon			
Sales	**Douala**	Electro-Services Rue Drouot Akwa B.P. 2024 Douala	Tel. +237 33 431137 Fax +237 33 431137

Canada			
Assembly **Sales** **Service**	**Toronto**	SEW-EURODRIVE CO. OF CANADA LTD. 210 Walker Drive Bramalea, Ontario L6T3W1	Tel. +1 905 791-1553 Fax +1 905 791-2999 http://www.sew-eurodrive.ca marketing@sew-eurodrive.ca
	Vancouver	SEW-EURODRIVE CO. OF CANADA LTD. 7188 Honeyman Street Delta. B.C. V4G 1 E2	Tel. +1 604 946-5535 Fax +1 604 946-2513 marketing@sew-eurodrive.ca
	Montreal	SEW-EURODRIVE CO. OF CANADA LTD. 2555 Rue Leger LaSalle, Quebec H8N 2V9	Tel. +1 514 367-1124 Fax +1 514 367-3677 marketing@sew-eurodrive.ca
	Additional addresses for service in Canada provided on request!		

Chile			
Assembly **Sales** **Service**	**Santiago de Chile**	SEW-EURODRIVE CHILE LTDA. Las Encinas 1295 Parque Industrial Valle Grande LAMPA RCH-Santiago de Chile P.O. Box Casilla 23 Correo Quilicura - Santiago - Chile	Tel. +56 2 75770-00 Fax +56 2 75770-01 http://www.sew-eurodrive.cl ventas@sew-eurodrive.cl

China			
Production **Assembly** **Sales** **Service**	**Tianjin**	SEW-EURODRIVE (Tianjin) Co., Ltd. No. 78, 13th Avenue, TEDA Tianjin 300457	Tel. +86 22 25322612 Fax +86 22 25322611 gm-tianjin@sew-eurodrive.cn http://www.sew-eurodrive.com.cn
Assembly **Sales** **Service**	**Suzhou**	SEW-EURODRIVE (Suzhou) Co., Ltd. 333, Suhong Middle Road Suzhou Industrial Park Jiangsu Province, 215021 P. R. China	Tel. +86 512 62581781 Fax +86 512 62581783 suzhou@sew.com.cn
	Additional addresses for service in China provided on request!		

Colombia			
Assembly **Sales** **Service**	**Bogotá**	SEW-EURODRIVE COLOMBIA LTDA. Calle 22 No. 132-60 Bodega 6, Manzana B Santafé de Bogotá	Tel. +57 1 54750-50 Fax +57 1 54750-44 http://www.sew-eurodrive.com.co sewcol@sew-eurodrive.com.co

Croatia			
Sales **Service**	**Zagreb**	KOMPEKS d. o. o. PIT Erdödy 4 II HR 10 000 Zagreb	Tel. +385 1 4613-158 Fax +385 1 4613-158 kompeks@net.hr

Czech Republic			
Sales	**Praha**	SEW-EURODRIVE CZ S.R.O. Business Centrum Praha Lužná 591 CZ-16000 Praha 6 - Vokovice	Tel. +420 220121234 Fax +420 220121237 http://www.sew-eurodrive.cz sew@sew-eurodrive.cz

Denmark			
Assembly **Sales** **Service**	**Kopenhagen**	SEW-EURODRIVEA/S Geminivej 28-30 DK-2670 Greve	Tel. +45 43 9585-00 Fax +45 43 9585-09 http://www.sew-eurodrive.dk sew@sew-eurodrive.dk

Estonia			
Sales	**Tallin**	ALAS-KUUL AS Reti tee 4 EE-75301 Peetri küla, Rae vald, Harjumaa	Tel. +372 6593230 Fax +372 6593231 veiko.soots@alas-kuul.ee

Finland			
Assembly **Sales** **Service**	**Lahti**	SEW-EURODRIVE OY Vesimäentie 4 FIN-15860 Hollola 2	Tel. +358 201 589-300 Fax +358 3 780-6211 sew@sew.fi http://www.sew-eurodrive.fi

Gabon			
Sales	**Libreville**	Electro-Services B.P. 1889 Libreville	Tel. +241 7340-11 Fax +241 7340-12

Great Britain			
Assembly **Sales** **Service**	**Normanton**	SEW-EURODRIVE Ltd. Beckbridge Industrial Estate P.O. Box No.1 GB-Normanton, West- Yorkshire WF6 1QR	Tel. +44 1924 893-855 Fax +44 1924 893-702 http://www.sew-eurodrive.co.uk info@sew-eurodrive.co.uk

Greece			
Sales **Service**	**Athen**	Christ. Boznos & Son S.A. 12, Mavromichali Street P.O. Box 80136, GR-18545 Piraeus	Tel. +30 2 1042 251-34 Fax +30 2 1042 251-59 http://www.boznos.gr info@boznos.gr

Hong Kong			
Assembly **Sales** **Service**	**Hong Kong**	SEW-EURODRIVE LTD. Unit No. 801-806, 8th Floor Hong Leong Industrial Complex No. 4, Wang Kwong Road Kowloon, Hong Kong	Tel. +852 2 7960477 + 79604654 Fax +852 2 7959129 contact@sew-eurodrive.hk

Hungary			
Sales **Service**	**Budapest**	SEW-EURODRIVE Kft. H-1037 Budapest Kunigunda u. 18	Tel. +36 1 437 06-58 Fax +36 1 437 06-50 office@sew-eurodrive.hu

India			
Assembly **Sales** **Service**	**Baroda**	SEW-EURODRIVE India Pvt. Ltd. Plot No. 4, Gidc Por Ramangamdi • Baroda - 391 243 Gujarat	Tel. +91 265 2831086 Fax +91 265 2831087 http://www.seweurodriveindia.com mdoffice@seweurodriveindia.com
Technical Offices	**Bangalore**	SEW-EURODRIVE India Private Limited 308, Prestige Centre Point 7, Edward Road Bangalore	Tel. +91 80 22266565 Fax +91 80 22266569 salesbang@seweurodriveindia.com

Ireland			
Sales **Service**	**Dublin**	Alperton Engineering Ltd. 48 Moyle Road Dublin Industrial Estate Glasnevin, Dublin 11	Tel. +353 1 830-6277 Fax +353 1 830-6458 info@alperton.ie

Israel			
Sales	**Tel-Aviv**	Liraz Handasa Ltd. Ahofer Str 34B / 228 58858 Holon	Tel. +972 3 5599511 Fax +972 3 5599512 office@liraz-handasa.co.il

Italy			
Assembly **Sales** **Service**	**Milano**	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via Bernini,14 I-20020 Solaro (Milano)	Tel. +39 02 96 9801 Fax +39 02 96 799781 http://www.sew-eurodrive.it sewit@sew-eurodrive.it

Ivory Coast			
Sales	**Abidjan**	SICA Ste industrielle et commerciale pour l'Afrique 165, Bld de Marseille B.P. 2323, Abidjan 08	Tel. +225 2579-44 Fax +225 2584-36

Japan			
Assembly **Sales** **Service**	**Iwata**	SEW-EURODRIVE JAPAN CO., LTD 250-1, Shimoman-no, Iwata Shizuoka 438-0818	Tel. +81 538 373811 Fax +81 538 373814 http://www.sew-eurodrive.co.jp sewjapan@sew-eurodrive.co.jp

Korea			
Assembly **Sales** **Service**	**Ansan-City**	SEW-EURODRIVE KOREA CO., LTD. B 601-4, Banweol Industrial Estate 1048-4, Shingil-Dong Ansan 425-120	Tel. +82 31 492-8051 Fax +82 31 492-8056 http://www.sew-korea.co.kr master@sew-korea.co.kr

Latvia			
Sales	**Riga**	SIA Alas-Kuul Katlakalna 11C LV-1073 Riga	Tel. +371 7139253 Fax +371 7139386 http://www.alas-kuul.com info@alas-kuul.com

Lebanon			
Sales	**Beirut**	Gabriel Acar & Fils sarl B. P. 80484 Bourj Hammoud, Beirut	Tel. +961 1 4947-86 +961 1 4982-72 +961 3 2745-39 Fax +961 1 4949-71 gacar@beirut.com

Lithuania			
Sales	**Alytus**	UAB Irseva Naujoji 19 LT-62175 Alytus	Tel. +370 315 79204 Fax +370 315 56175 info@irseva.lt http://www.sew-eurodrive.lt

Luxembourg			
Assembly **Sales** **Service**	**Brüssel**	CARON-VECTOR S.A. Avenue Eiffel 5 B-1300 Wavre	Tel. +32 10 231-311 Fax +32 10 231-336 http://www.sew-eurodrive.lu info@caron-vector.be

Malaysia			
Assembly **Sales** **Service**	**Johore**	SEW-EURODRIVE SDN BHD No. 95, Jalan Seroja 39, Taman Johor Jaya 81000 Johor Bahru, Johor West Malaysia	Tel. +60 7 3549409 Fax +60 7 3541404 sales@sew-eurodrive.com.my

Mexico			
Assembly **Sales** **Service**	**Queretaro**	SEW-EURODRIVE MEXIKO SA DE CV SEM-981118-M93 Tequisquiapan No. 102 Parque Industrial Queretaro C.P. 76220 Queretaro, Mexico	Tel. +52 442 1030-300 Fax +52 442 1030-301 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx

Morocco			
Sales	**Casablanca**	Afit 5, rue Emir Abdelkader MA 20300 Casablanca	Tel. +212 22618372 Fax +212 22618351 ali.alami@premium.net.ma

Netherlands			
Assembly **Sales** **Service**	**Rotterdam**	VECTOR Aandrijftechniek B.V. Industrieweg 175 NL-3044 AS Rotterdam Postbus 10085 NL-3004 AB Rotterdam	Tel. +31 10 4463-700 Fax +31 10 4155-552 http://www.vector.nu info@vector.nu

New Zealand			
Assembly **Sales** **Service**	**Auckland**	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount drive East Tamaki Auckland	Tel. +64 9 2745627 Fax +64 9 2740165 http://www.sew-eurodrive.co.nz sales@sew-eurodrive.co.nz
	Christchurch	SEW-EURODRIVE NEW ZEALAND LTD. 10 Settlers Crescent, Ferrymead Christchurch	Tel. +64 3 384-6251 Fax +64 3 384-6455 sales@sew-eurodrive.co.nz

Norway			
Assembly **Sales** **Service**	**Moss**	SEW-EURODRIVE A/S Solgaard skog 71 N-1599 Moss	Tel. +47 69 241-020 Fax +47 69 241-040 http://www.sew-eurodrive.no sew@sew-eurodrive.no

Peru			
Assembly **Sales** **Service**	**Lima**	SEW DEL PERU MOTORES REDUCTORES S.A.C. Los Calderos, 120-124 Urbanizacion Industrial Vulcano, ATE, Lima	Tel. +51 1 3495280 Fax +51 1 3493002 http://www.sew-eurodrive.com.pe sewperu@sew-eurodrive.com.pe

Poland			
Assembly **Sales** **Service**	**Lodz**	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 5 PL-92-518 Łódź	Tel. +48 42 67710-90 Fax +48 42 67710-99 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl

Portugal			
Assembly **Sales** **Service**	**Coimbra**	SEW-EURODRIVE, LDA. Apartado 15 P-3050-901 Mealhada	Tel. +351 231 20 9670 Fax +351 231 20 3685 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt

Romania			
Sales **Service**	**Bucureşti**	Sialco Trading SRL str. Madrid nr.4 011785 Bucuresti	Tel. +40 21 230-1328 Fax +40 21 230-7170 sialco@sialco.ro

Russia			
Assembly **Sales** **Service**	**St. Petersburg**	ZAO SEW-EURODRIVE P.O. Box 36 195220 St. Petersburg Russia	Tel. +7 812 3332522 +7 812 5357142 Fax +7 812 3332523 http://www.sew-eurodrive.ru sew@sew-eurodrive.ru

Senegal			
Sales	**Dakar**	SENEMECA Mécanique Générale Km 8, Route de Rufisque B.P. 3251, Dakar	Tel. +221 849 47-70 Fax +221 849 47-71 senemeca@sentoo.sn

Serbia			
Sales	**Beograd**	DIPAR d.o.o. Ustanicka 128a PC Košum, IV floor SCG-11000 Beograd	Tel. +381 11 347 3244 / +381 11 288 0393 Fax +381 11 347 1337 dipar@yubc.net

Singapore			
Assembly **Sales** **Service**	**Singapore**	SEW-EURODRIVE PTE. LTD. No 9, Tuas Drive 2 Jurong Industrial Estate Singapore 638644	Tel. +65 68621701 Fax +65 68612827 http://www.sew-eurodrive.com.sg sewsingapore@sew-eurodrive.com

Slovakia			
Sales	**Bratislava**	SEW-Eurodrive SK s.r.o. Rybničná 40 SK-83554 Bratislava	Tel. +421 2 49595201 Fax +421 2 49595200 sew@sew-eurodrive.sk http://sk.sew-eurodrive.com
	Žilina	SEW-Eurodrive SK s.r.o. ul. Vojtecha Spanyola 33 SK-010 01 Žilina	Tel. +421 41 700 2513 Fax +421 41 700 2514 sew@sew-eurodrive.sk
	Banská Bystrica	SEW-Eurodrive SK s.r.o. Rudlovská cesta 85 SK-97411 Banská Bystrica	Tel. +421 48 414 6564 Fax +421 48 414 6566 sew@sew-eurodrive.sk

Slovenia			
Sales **Service**	**Celje**	Pakman - Pogonska Tehnika d.o.o. UI. XIV. divizije 14 SLO - 3000 Celje	Tel. +386 3 490 83-20 Fax +386 3 490 83-21 pakman@siol.net

South Africa			
Assembly **Sales** **Service**	**Johannesburg**	SEW-EURODRIVE (PROPRIETARY) LIMITED Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext. 2 Johannesburg 2013 P.O.Box 90004 Bertsham 2013	Tel. +27 11 248-7000 Fax +27 11 494-3104 http://www.sew.co.za dross@sew.co.za
	Capetown	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens Cape Town P.O.Box 36556 Chempet 7442 Cape Town	Tel. +27 21 552-9820 Fax +27 21 552-9830 Telex 576 062 dswanepoel@sew.co.za

South Africa			
	Durban	SEW-EURODRIVE (PROPRIETARY) LIMITED 2 Monaceo Place Pinetown Durban P.O. Box 10433, Ashwood 3605	Tel. +27 31 700-3451 Fax +27 31 700-3847 dtait@sew.co.za
Spain			
Assembly **Sales** **Service**	**Bilbao**	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 E-48170 Zamudio (Vizcaya)	Tel. +34 94 43184-70 Fax +34 94 43184-71 http://www.sew-eurodrive.es sew.spain@sew-eurodrive.es
Sweden			
Assembly **Sales** **Service**	**Jönköping**	SEW-EURODRIVE AB Gnejsvägen 6-8 S-55303 Jönköping Box 3100 S-55003 Jönköping	Tel. +46 36 3442-00 Fax +46 36 3442-80 http://www.sew-eurodrive.se info@sew-eurodrive.se
Switzerland			
Assembly **Sales** **Service**	**Basel**	Alfred Imhof A.G. Jurastrasse 10 CH-4142 Münchenstein bei Basel	Tel. +41 61 417 1717 Fax +41 61 417 1700 http://www.imhof-sew.ch info@imhof-sew.ch
Thailand			
Assembly **Sales** **Service**	**Chonburi**	SEW-EURODRIVE (Thailand) Ltd. 700/456, Moo.7, Donhuaroh Muang Chonburi 20000	Tel. +66 38 454281 Fax +66 38 454288 sewthailand@sew-eurodrive.com
Tunisia			
Sales	**Tunis**	T. M.S. Technic Marketing Service 5, Rue El Houdaibiah 1000 Tunis	Tel. +216 71 4340-64 + 71 4320-29 Fax +216 71 4329-76 tms@tms.com.tn
Turkey			
Assembly **Sales** **Service**	**Istanbul**	SEW-EURODRIVE Hareket Sistemleri San. ve Tic. Ltd. Sti. Bagdat Cad. Koruma Cikmazi No. 3 TR-34846 Maltepe ISTANBUL	Tel. +90 216 4419163 / 164 3838014/15 Fax +90 216 3055867 http://www.sew-eurodrive.com.tr sew@sew-eurodrive.com.tr
Ukraine			
Sales **Service**	**Dnepropetrovsk**	SEW-EURODRIVE Str. Rabochaja 23-B, Office 409 49008 Dnepropetrovsk	Tel. +380 56 370 3211 Fax +380 56 372 2078 http://www.sew-eurodrive.ua sew@sew-eurodrive.ua
Sales	**Kiev**	SEW-EURODRIVE GmbH S. Oleynika str. 21 02068 Kiev	Tel. +380 44 503 95 77 Fax +380 44 503 95 78 kso@sew-eurodrive.ua
USA			
Production **Assembly** **Sales** **Service**	**Greenville**	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 864 439-7537 Fax Sales +1 864 439-7830 Fax Manuf. +1 864 439-9948 Fax Ass. +1 864 439-0566 Telex 805 550 http://www.seweurodrive.com cslyman@seweurodrive.com

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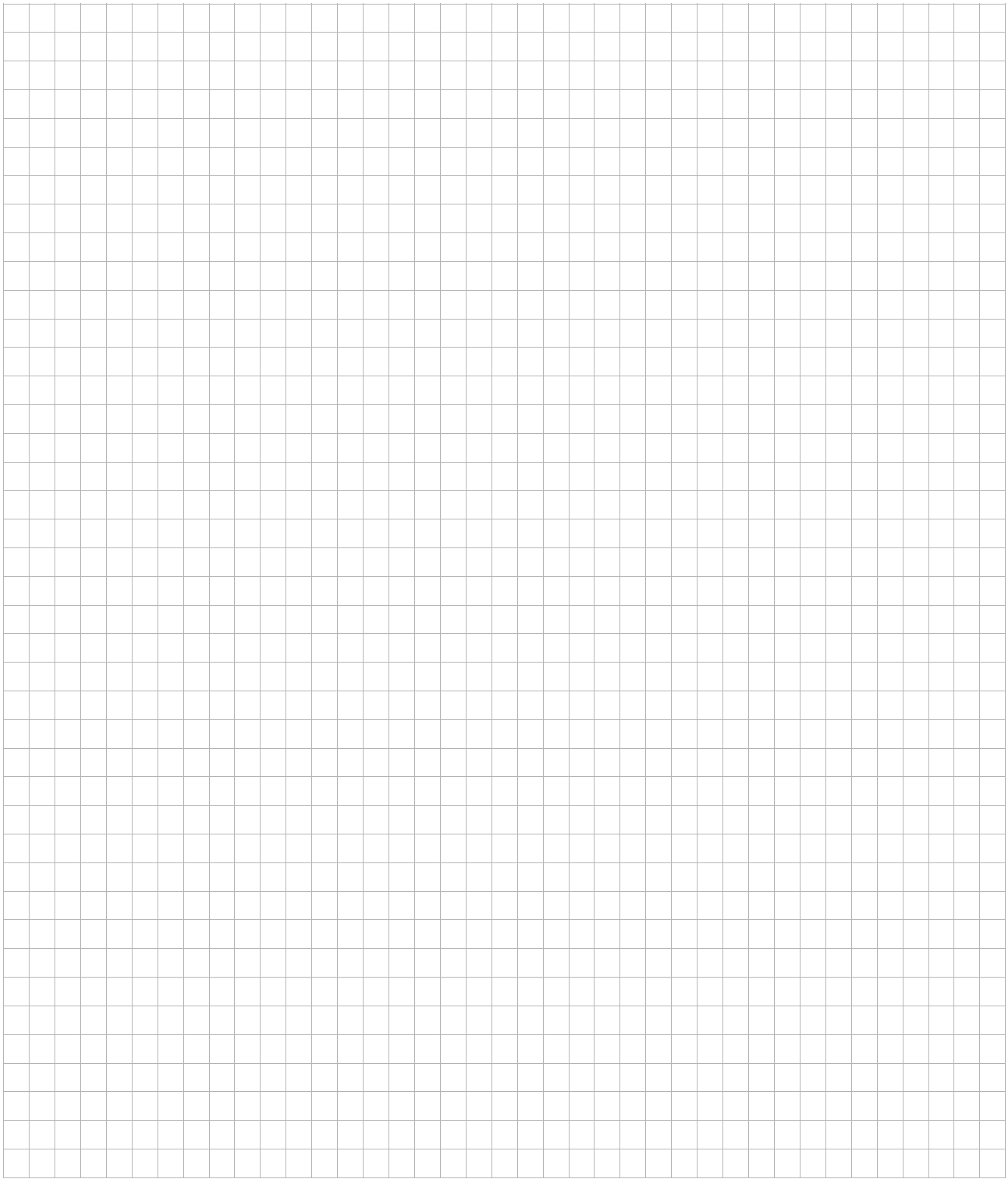

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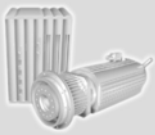

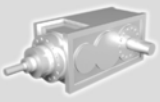

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